THE DISEASES AND DEFORMITIES OF THE FŒTUS.

THE DISEASES AND DEFORMITIES OF THE FŒTUS:

AN ATTEMPT TOWARDS

A SYSTEM OF ANTE-NATAL PATHOLOGY.

BY

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WITH PLATES AND OTHER ILLUSTRATIONS.

VOLUME I.

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TO

CESARE TARUFFI,

PROFESSOR OF PATHOLOGICAL ANATOMY IN THE UNIVERSITY OF BOLOGNA, AND AUTHOR OF "STORIA DELLA TERATOLOGIA;"

CAMILLE DARESTE,

DIRECTOR OF THE TERATOLOGICAL LABORATORY, PARIS; AND AUTHOR OF "RECHERCHES SUR LA PRODUCTION ARTIFICIELLE DES MONSTRUOSITÉS;"

AND TO THE

PRESIDENT (PROFESSOR A. R. SIMPSON)

AND

FELLOWS OF THE OBSTETRICAL SOCIETY OF EDINBURGH,

THIS WORK IS RESPECTFULLY DEDICATED

BY

THE AUTHOR.

"*Ad mortem maturi omnes sumus, etiam antequam nati.*"—Justus Lipsius (1547-1606), Cent. ad Belg. Ep. 5.

"*Tam misera ac aerumnosa generis humani conditio est, ut non modo innumeris malis per vitam homines crucientur, verum etiam, ut intra carceres uterinos adhuc conclusi fœtus, antequam vitali hac aura fruantur, et lucem aspiciant a malis atque aegritudinibus non immunes sint.*"—P. J. Düttel. Diss. Inaug., Halae Magdeburgicae, 1702.

"*L'oeuf fécondé jouit de la vie, sujet par conséquent aux maladies, à la mort.*" —Vernet, Thèse, Montpellier, 1856.

PREFACE.

In commencing the work of which this volume is the first instalment, I am fully conscious of the many difficulties which lie in the way of its successful completion. I have, however, been so greatly cheered by the kindly and encouraging notices of my recently published book, which dealt with the anatomy, physiology, and hygiene of the new-born infant, and I have received such generous help from many medical friends, who have sent me specimens of fœtal disease and deformity, and have aided me in other ways, that I venture now to put forth the first part of a work devoted to fœtal pathology.

I have been exceptionally fortunate in having been able to see, and in most instances to dissect, specimens of a large number of the principal varieties of the diseases and deformities that may affect the fœtus and its annexa, and have from time to time published in the medical papers the results of the examination of these individual cases;[1] but it has long been my desire to bring

[1] "On General Dropsy of the Fœtus," *Edinburgh Obstetrical Society Transactions*, vol. xii., 1887, and *Edinburgh Medical Journal* for July, August, and September, 1892; "Sclerema and Œdema Neonatorum," *British Medical Journal*, February 22, 1890; "Intra-uterine Rickets," *Edinburgh Medical Journal* for June 1890; "Maternal Impressions," *Edinburgh Medical Journal* for January 1891, and for May 1892; "Vascular Anomaly of the Membranes," *Edinburgh Medical Journal* for May 1891; "Disease in Early Infancy," *British Medical Journal*, February 13, 1892; "Investigation of Fœtal Diseases," *Edinburgh Medical Journal* for March 1892; "Rupture of the Spleen in a New-born Infant," *Archives of Pediatrics*, April 1892; "Sectional Anatomy of an Anencephalic Fœtus," *Journal of Anatomy and Physiology*, vol. xxvi., July 1892; "Notes on Cases of Peritonitis, Ante-mortem Clotting in the Heart, Syphilitic Liver, and Uterus Bicornis Septus in the New-born Infant,"

together systematically and within the compass of one work the investigations of other observers in this field of study, and to compare my own with them, and that desire has resulted in the publication of this book. In it I shall attempt to describe, with a fulness equal to the importance of the subject, the diseases and deformities of the fœtus and its annexa, and I trust that I may at least be able thus to attract to this field of research that measure of attention and inquiry which it undoubtedly deserves, but has not yet received.

In the present volume a large amount of space is occupied with introductory matter, such as the scope and interest of the subject and the methods of investigation; but the peculiar circumstances of the position of this department warrant me in devoting so many pages to these initial considerations. With the third chapter begins the study of the first great division of the work, THE DISEASES PROPERLY SO-CALLED OF THE FŒTUS, and in it and in the four succeeding chapters I have endeavoured to give a sketch of the history of the subject. It may be thought that undue prominence has been given to this historical sketch, but the reason for so doing is found in the fact that writings upon fœtal maladies are widely scattered throughout medical literature, are frequently in the form of Latin dissertations, are often difficult of access, and are in many instances out of print. Much of the literature was not to be found in any of the libraries open to me, and was only obtained with some difficulty from the Continent; but I must at the same time acknowledge my indebtedness to the Librarians of the Royal College of Physicians, of the University, and of the Royal Society of Edinburgh, for the ready help they

in the *Transactions of the Edinburgh Obstetrical Society*, vol. xv.; "On a Case of Encephalocele," *Edinburgh Medical Journal*, February 1891; "On a Dermoid Tumour with Osseous Walls," *Edinburgh Medical Journal*, February 1892; "Notes on Retarded Development of the Embryo, on Exomphalos and Anencephaly, on Umbilical Hernia, on Multiple Fœtal Deformities, and on Hernia of the Umbilical Cord," in the *Edinburgh Medical Journal* for July 1892; "On Frozen Sections of an Exomphalic and Anencephalic Fœtus, on a Knotted Umbilical Cord, and on Velamentous Insertion of the Umbilical Cord," *Edinburgh Medical Journal* for August 1892; and "On a Case-taking Scheme for Fœtal Diseases and Deformities," *Edinburgh Medical Journal*, November 1892.

gave me, and tender my thanks to Professor Russell Simpson for allowing me the free use of his own library and that of the late Sir James Y. Simpson.

Chapters VIII. and IX. are occupied with the consideration of schemes of classification and of certain general characteristics of fœtal disease, and the rest of the volume is devoted to the study of some of the idiopathic maladies of the unborn infant. General fœtal dropsy, a condition which yields in importance only to fœtal rickets and ante-natal syphilis, is treated of at some length, and along with it is considered the so-called congenital cystic elephantiasis.

In the second volume the remaining idiopathic and some of the transmitted morbid states will be dealt with, and in the third volume the consideration of the diseases proper of the fœtus will be brought to a conclusion. Beyond this point I dare scarcely look; but the remainder of the work will be occupied with the deformities of the fœtus.

I may here claim priority for this book, in the sense that it is the first in which the attempt has been made to discuss together and at any length in one work both the diseases and the deformities of the fœtus.

I must now record my indebtedness to the many medical friends who have so generously placed at my disposal valuable specimens for examination. My thanks are specially due to Professor A. R. Simpson, Sir William Turner, and Dr Symington, who have not only given me material, but have also aided me by their counsel and by the results of their experience. I have also to thank the following gentlemen for interesting specimens of fœtal disease and deformity: Drs A. H. F. Barbour, N. T. Brewis, James Carmichael, T. B. Darling, W. N. Elder, G. L. Gulland, Thomas Lawson, D. Menzies, William Paterson, A. T. Sloan, James Smith, R. Stewart, T. J. Thyne, and C. E. Underhill, of Edinburgh; Drs Cowan Guthrie, J. W. Martin, and Fraser Wright, of Leith; and Drs Ballantyne of Dalkeith, Baildon of Southport, Edmondson of St Helens, Freeland of Broxburn, A. A. Martin of South Shields, and Miller of Sunderland.

The dissection and microscopic investigation of the specimens

have been carried out in the Obstetrical Laboratory of the University, and in the Laboratory of the Royal College of Physicians, Edinburgh, and to the Superintendent of the latter, Dr Noël Paton, I am indebted for valuable advice. Seven of the Plates used to illustrate this volume were drawn from specimens in my possession; the remaining five were copied from the works of Meckel, Wernher, Steinwirker, Betschler, Sänger, Neelsen, and Raineri. I have also to thank Mr James A. Melville for help in the revision of the proof sheets, Mr William Cathie for the accurate manner in which he has prepared the Plates illustrating the text, and my publishers Messrs Oliver & Boyd, and Mr Hugh Cameron, the Manager of their printing department, for the great care they have exercised in the production of the work.

J. W. BALLANTYNE.

24 Melville Street, Edinburgh,
November, 1892.

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THE

DISEASES AND DEFORMITIES OF THE FŒTUS.

CHAPTER I.

THE STUDY OF FŒTAL PATHOLOGY.

ITS SCOPE—DELAYED RATE OF PROGRESS—CAUSES OF DELAY: INNATE DIFFICULTIES—BACKWARD STATE OF ALLIED SUBJECTS, EMBRYOLOGY AND FŒTAL PHYSIOLOGY—LOW ESTIMATE OF VALUE OF FŒTAL LIFE AND HEALTH—EVIDENCES OF DELAY: ABSENCE OF INFORMATION ON FŒTAL DISEASES IN THE TEACHING, ORAL AND WRITTEN, OF THE TIME—THE CHARACTER OF THE NOMENCLATURE EMPLOYED—THE HIGH RATE OF INFANT MORTALITY.

THE department of medical study which is concerned with fœtal and congenital disease is a large one. In its range it embraces the investigation of all the morbid states of the embryo and fœtus, of the membranes, placenta, and cord, and of the infant at the time of birth. It also concerns itself with the effect of these processes upon the health not only of the infant himself but also of the mother who bears him, and it is closely allied to the study of all the mysterious phenomena of heredity.

It has not been customary to consider in one work all that relates to fœtal disease; and whilst some writers have paid special attention to the deformities, anomalies, and monstrosities, others have devoted themselves to the diseases properly so-called of the fœtus, and others again have dealt somewhat exclusively with pathological states of the fœtal annexa—the placenta, membranes, and umbilical cord. It has thus come about that a somewhat artificial division of the whole subject into three departments has taken place: these three are—first, fœtal diseases proper; second, morbid states of the fœtal annexa; and, third, fœtal malformations. This division, although artificial, is convenient, and it is the basis of the classification that has been adopted in this

work, for it is necessary in the case of such a large subject as intra-uterine pathology to have some system of grouping the recorded facts and discoveries. The divisions overlap each other, for some malformations may be the causes of fœtal disease, others the effects of these processes; and in the same way morbid states of the placenta may in some instances follow, in others precede, the disease or deformity in the fœtus. Notwithstanding this overlapping, which is unavoidable, the above-mentioned subdivision of the subject into three parts is that which will be followed out in this work; at the same time repetition will be as far as possible avoided.

Some idea of the scope of the subject will have been gained from what has just been said, and as the investigator pursues his inquiries in this field of research he will probably be surprised by the number and variety of abnormal processes that affect the fœtus in utero and its annexa. "Considering," says Montgomery,* "the peculiar circumstances of the fœtus in utero, we would, at first sight, be inclined to suppose that, although of course exposed to the risk of injury from accidents or diseases occurring to the mother, it would not be liable to many or serious accidents of its own; nevertheless, observation and experience soon reveal to us a very different state of facts, and force upon us the sad truth that the seeds of life are very often sown adulterated with those of infirmity and decay, that disease may mutilate and death destroy, even before our entrance into life." All that has been discovered with regard to fœtal pathology since Montgomery's time has fully confirmed his estimate.

The study of intra-uterine pathology and of the diseases of the fœtus is a subject which has been allowed to lag somewhat in the rear of the more rapidly growing and more generally investigated branches of medical practice. Yet it is a department of medicine which offers to the scientist some of the most interesting and most difficult problems that have ever been presented for solution, and it embraces the consideration of questions which are of the utmost importance to the welfare of the human race. For ante-natal diseases have a far-reaching influence upon the health, not only of the fœtus in utero but also of the child after birth and of the

* Montgomery (W. F.), Article "Fœtus," Todd's *Cyclopædia of Anatomy and Physiology*, vol. ii. p. 316, 1836–1839.

mother who has borne it. Of late years the study of the pathology of the adult organism has advanced with giant strides, but fœtal morbid anatomy has not progressed *pari passu* therewith. The same remark might with equal justice be applied to the investigation of certain of the diseases of the new-born infant, maladies which are so closely allied to, and often so directly dependent upon those occurring before birth that it would be wrong, even if it were not impossible, to disassociate their consideration. For many of the congenital diseases have existed potentially in utero, and have required only the change in environment incident to birth to bring them into activity. Others, again, have been in operation during intra-uterine life and have had their effects modified, have in some instances, indeed, had their morbid action destroyed by the change to an extra-uterine existence. It is impossible, therefore, rigidly to divorce the study of fœtal maladies from that of the diseases of the new-born infant; the one subject serves to elucidate the other.

That fœtal pathology is a subject concerning which there is a real absence of knowledge and a real need for thorough research is a circumstance which has arisen from several causes. Some of these may be here conveniently stated.

There are, first, the innate difficulties of the subject. The diseases of the fœtus are, during their evolution, hidden from the eye, and the observer is left to judge of their characters from the appearances visible when the infant is born. It goes without saying, that such appearances may differ very markedly from those which existed during intra-uterine life; and if the disease have led to fœtal death, there will be superadded the post-mortem changes of maceration or mummification. It becomes, therefore, almost impossible to obtain a complete clinical picture of any one of the diseases or deformities which affect the fœtus or its annexa; we can only hope for glimpses of the condition in different cases and at different stages in its development, depending upon the progress the disease has made at the time when abortion or labour occurs. It is true that vague indications of the state of health and vitality of the fœtus may be obtained from the feelings of the pregnant woman, and from the examination of her uterus, abdomen, and mammæ. Irregularities in the rate of growth of the uterine tumour, and quickening or slowing of the fœtal heart-

sounds, may indicate disease of the uterine contents; and cessation of the fœtal movements, along with retrogressive changes in the mammæ, and perhaps maternal peptonuria and certain subjective phenomena, may denote the death of the unborn infant; but these aids to diagnosis are neither very constant nor very conclusive, and they do not afford much information regarding the nature of the fœtal malady or the cause of the cessation of vitality. That this state of matters is likely to persist unaltered I do not for one moment imagine, for it is impossible to believe that further research will not open up new, and utilise the results of old methods of investigation to the advantage of the diagnostician; but at present it must be confessed that the study of the symptomatology of fœtal disease is comparatively unfruitful in results of any value.

The impossibility of diagnosing with any degree of certainty the presence of morbid processes in the fœtus in utero forms one of the innate difficulties of this subject; but there are others also. The characters of the pathological changes that occur in the unborn infant are puzzling, for they in many instances differ markedly from those which are met with in the adult. The study of the diseases of the skeleton of the fœtus forms a suggestive example of this kind of difficulty. Then, again, the pathogenesis, the prognosis, and the treatment of ante-natal maladies are subjects regarding which little can be definitely ascertained, and this fact has served still further to discourage research in this department of medicine.

Another circumstance which has interfered with the development of a system of fœtal pathology is found in the fact that until comparatively recent times embryology and fœtal physiology have been but imperfectly understood. Now a knowledge of these subjects must of necessity precede any attempt to master the intricate problems of fœtal pathology. That large subdivision of intra-uterine pathology known as teratology made little or no progress until the microscope made possible the investigation of the development of the early embryo; and in a similar manner it was not till clear conceptions concerning fœtal nutrition, circulation, and innervation were gained that it became possible to understand many of the diseases of the fœtus. It may be confidently predicted that each advance in the study of embryology and of fœtal physiology will add to the clearness of our views upon

fœtal disease. Reciprocally, the study of intra-uterine disease will throw fresh light upon the development and the functions of the embryo. It has indeed already done so. Every fœtal disease or anomaly is an instance of a natural pathological experiment, from which much may be learnt by the attentive observers. Many hints have, for instance, been gathered from the study of anencephalic and acardiac fœtuses which have aided the physiologist in his inquiries into the functions of the nervous and circulatory systems in the embryo; and the observation of double-monsters has been fruitful in suggestions concerning early embryological conditions. But, whilst this is so, still the correct understanding of fœtal morbid states depends upon, and has been influenced by, the rate of progress in the allied subjects of embryology and biology, a rate which until recent times has been somewhat slow. Rational physiological views must precede a complete system of pathology in the fœtus as well as in the adult.

A third cause of delay in the acquisition of knowledge concerning fœtal disease is to be sought for in a totally different direction. The tendency of the observer has ever been to neglect matters of apparently minor interest for those of major importance. *De minimis non curat lex* is a maxim which has been adopted in medicine as well as in law. The study of the diseases which affect the fœtus has been thrust into the background by the investigation of the maladies of the head of the house, of the mother of the family, and of the elder children. The mercantile value, if we may so express it, of fœtal life has been put at a very low estimate compared with that of the health of the bread-winner or the mother. Even at the present time it is more than probable that many cases of fœtal disease pass unnoticed, and many go unrecorded simply *because they are fœtal.* There seems also to be a somewhat widespread belief that observations upon ante-natal diseased states, however interesting from a theoretical point of view, are not likely to yield much information of a practically applicable kind. There can be no doubt that these methods of regarding the subject of fœtal disease have been potent factors in retarding progress, and in delaying the establishment of a complete system of fœtal pathology and therapeutics.

When a glance is cast over that department of medical science

devoted to the study of congenital and fœtal diseases and deformities, it becomes at once apparent that the signs of immaturity are everywhere present. Reports of cases are indeed to be found in large numbers scattered throughout medical literature, but the manner in which they are recorded, and even the nomenclature which is employed, both point to an early, chaotic, and unsettled stage in the evolution of the branch of study to which they belong. The subject still awaits the appearance of "some central mind that shall group such diseases together in their respective classes, and elaborate a true and philosophical system of uterine pathology."

Evidence in support of the contention that the science of antenatal medicine is still in its infancy is forthcoming from various sources, and is of various kinds.

1. A very evident proof is to be found in the scanty and uncertain information concerning the diseases of the fœtus to be found in medical text-books and in the lectures of medical teachers. Whilst there are a few notable exceptions to this statement, the general rule holds good, that fœtal pathology occupies but a small place in the curriculum of medical study, with the inevitable result that the hard-worked general practitioner, who has already great difficulty in keeping pace with the new discoveries in medicine, surgery, and obstetrics, is compelled to abandon as hopeless the attempt to understand the diseases of the unborn, and also to some extent those of the new-born infant.

2. The nomenclature of fœtal maladies is in itself evidence of the delayed progress of this subject of medical study, and of the necessity for scientific investigation in this field of research. With few exceptions, the terminology is one based upon symptoms and not upon the pathological conditions which produce these symptoms—it is a symptomatological nomenclature. We use, in speaking of the diseases of the fœtus and new-born infant, expressions such as general dropsy, anasarca, jaundice, cyanosis, melæna, œdema, and apnœa—terms which we should hesitate to employ when naming the maladies of later life, but which remind us of the expressions used in medical works of the last century. In some cases even the symptomatological nomenclature is absent, and the disease is named after the first writer who described it fully, and thus it comes that such expressions as Winckel's

Disease and Buhl's Disease are in common use. In other instances, again, different names are given to the same disease, or the same name is given to different maladies, with the result that an amount of confusion is introduced that would not be tolerated in the more advanced subjects of study. A terminology founded upon a symptom or upon the name of an observer, and so anomalous, is not evidence of satisfactory knowledge in any branch of medicine. It is not so long since another subject of medical study, gynæcology, was in a somewhat similar condition; but no one, nowadays, feels that his diagnosis of a gynæcological malady is complete or satisfactory when it is expressed in such terms as menorrhagia, leucorrhœa, or pelvic pain or swelling. Everyone knows that by menorrhagia is understood a symptom common to several maladies, differing much from one another in their pathology, in their danger to life, and in the treatment they require, and we ought to be able to regard such conditions as dropsy of the fœtus and jaundice of the new-born in a similar manner. But at the present time it must be admitted that it is nearly, if not quite, impossible to differentiate between fœtal dropsy due to anomalies of the blood or lymphatic system, and that produced by cardiac or renal disease; neither is it easy, in the case of an infant, to distinguish between a jaundice due to transient gastric or duodenal catarrh, and one caused by grave structural defects in the common bile-duct. It is not even in our power sometimes to state whether or not the jaundice in a given case may be simply the physiological expression of the circulatory alterations in the liver incident to the establishment of the pulmonary respiration at the time of birth. Diagnosis is commonly delayed till the case has terminated either in recovery or in death; and there is, therefore, no possibility of any certainty in prognosis in such cases. If the jaundice be slight and evanescent, it is termed *physiological;* if it be more persistent, but eventually disappear, it is designated *catarrhal;* whilst if it result in the death of the infant it is regarded as *pernicious* icterus neonatorum, and its morbid anatomy is made manifest by a post-mortem examination. The discovery of a sign or signs, which could be relied upon for the differentiation of the various maladies of the fœtus having œdema as a common symptom, and of the several diseases of

the new-born infant having their symptomatic expression in jaundice, would immensely help the pathologist and the physician in the diagnosis, prognosis, and treatment of such conditions. With regard to jaundice of the new-born infant, it is surely not too much to expect that such a sign as that indicated may ultimately be found in the blood or in the urine of the patient. The remarks which have been made with regard to œdema of the fœtus and icterus neonatorum may be extended to many other so-called fœtal and infantile maladies. Melæna, for example, is in all probability only a symptom of several widely different pathological states, and apnœa or asphyxia is no doubt simply the outward expression of various morbid conditions. Nothing has been said of the nomenclature of fœtal malformations, but even a passing glance at the works of the greatest teratologists will suffice to show that it also is in a most chaotic condition. Saint-Hilaire, Förster, Ahlfeld, and Taruffi employ different classifications and use terms which often vary much both in appearance and in meaning. Certainly this is no sign of great advance.

3. The high rate of fœtal and infantile mortality affords a third proof of retarded progress in the acquirement of accurate knowledge concerning the diseases of intra-uterine life. Whilst during the last fifty years the expectation of life has greatly increased for the adult man or woman, there has not been a similar improvement in the mortality tables of the first months of life. It is impossible to say exactly what is the fœtal death-rate, for accurate statistics are wanting; but it must be very high, for the frequency with which abortion occurs is well known. Indeed, it would seem that there are few women who complete their child-bearing life without having on one or more occasions had a miscarriage. Some idea of the intra-uterine death-rate may be formed from the tables furnished by Whitehead and by Priestley. Whitehead, who drew his results from a study of the poorer classes, found that of women under the age of 30 years, 37·35 per cent. had aborted, and that the ratio of abortions to pregnancies was approximately as 1 in 7; whilst Priestley, who investigated the miscarriage-rate in the well-to-do ranks of life, discovered that of women over 40 years of age, 62 per cent. had aborted, and that the ratio of abortions to pregnancies was about 1 in $4\frac{1}{3}$. Even if the mis-

carriage-rate were accurately known it would only indicate fœtal mortality, not fœtal morbidity. In order to form an estimate of the latter it is necessary to take account of the infants that are still-born, and of those that die during the first months of life from congenital disease, deformity, and weakness. The absence of a compulsory system of registration of still-births prevents us from arriving at any exact estimate of their frequency, but every medical man must admit that they are far from uncommon. With regard to the deaths which occur during the first year of life, more accurate statistics are forthcoming in the Registrar-General's Returns. During the year 1891 the rate of mortality for infants under one year of age was for the whole of England and Wales 149 per 1000. This was a little higher than the average rate during the preceding ten years, which was 142 per 1000, and was probably due to the epidemic of influenza which prevailed. In London it was 154 per 1000; and the average rate in the 28 large towns was 167 per 1000, varying from 227 in Preston to 137 per 1000 in Brighton. Now when it is remembered that the annual total death-rate for 1891 was 20·2 per 1000, it becomes very evident that infants of one year of age and under suffer to a most disproportionate extent, and if the returns are more closely scanned, it will be seen that during the first year also the liability to death is in inverse proportion to age. Infants are more likely to die in the first month of life than in the second, and on the first day than on the second. Further, a glance at the reports of medical officers of health all over the country serves to show that a high infantile mortality is their most striking feature. I quote at random from several of these reports: in one it is stated that "about one-third of the total deaths were in children under one year of age;" in another, "the most unsatisfactory item is the large proportion of deaths of infants;" in yet another, "the chief points are the low rate of zymotic mortality and the comparatively high rate of infant mortality." No great comfort can be derived from the statement that in 1891 the influenza was the cause of an increased infant death-rate, for a survey of the rate in the preceding ten years, when there was no influenza epidemic, shows a stationary condition of matters—for the expectation of life for the young infant was no better at the end of the decade than at the beginning.

Whilst this was the infantile death-rate in England, it was exceeded in several other European countries, in some of which the appalling figure of 300, or even of 400, per 1000 was reached.

Many of the deaths which occur during the first year of life cannot, of course, be ascribed directly to fœtal morbid states; but few will be prepared to assert that a great number of them are not due to conditions the result of intra-uterine disease or malnutrition. This contention is strengthened by the fact that the nearer to fœtal life the infant is the more likely is it to succumb. It may, however, be urged that a high fœtal and infantile death-rate is not an absolute proof of a want of knowledge of ante-natal pathology and etiology, for the reason that a great part of the mortality is immediately due to neglect and ignorance on the part of parents. But whilst parental carelessness is truly responsible for many deaths amongst infants, and whilst maternal ignorance is the cause of many miscarriages, yet there is, underlying this carelessness and ignorance in the laity, a real absence of knowledge in the medical profession. The practice of the people always reflects more or less accurately the teaching of the profession. It was not till medical men firmly grasped the dangers and defects of our sanitary appliances, and devised means to protect the people from them, that the preventable mortality of adult life began to diminish with most gratifying rapidity. Popular practice soon adopted the enlightened views of the profession. It is surely not altogether Utopian to look forward to a time when, with a fuller knowledge of the nature and causation of fœtal maladies, there will come a satisfactory diminution in the number of cases of intra-uterine and infantile disease and death. I fully believe that each advance in our appreciation of the laws that govern intra-uterine life and health will be followed by a shrinkage of the fœtal and infantile death-rate.

CHAPTER II.

THE STUDY OF FŒTAL PATHOLOGY—Continued.

INTEREST AND IMPORTANCE OF THE SUBJECT—METHODS OF INVESTIGATION—CASE-TAKING SCHEME.

As has already been said, the interest and importance of the study of fœtal maladies have not always been recognised, and it is doubtful whether the enormous value of researches in this branch of Medicine has ever been fully estimated. It is even matter for wonder that some master-mind has not been led to attempt to grapple with and overcome the difficulties with which the subject is so closely surrounded, to present the facts that have been already ascertained in a systematic and lucid manner, to arouse by his enthusiasm the interest of other investigators, and to demonstrate by the incontrovertible evidence of results the utility of such research. It is no disparagement to those who have by their investigations served to throw much light upon certain limited portions of this subject to say that no such mind has yet arisen. But it is not unreasonable to hope that what has been done for Gynæcology by Sir James Simpson, and for Bacteriology by Pasteur and Koch, may yet be accomplished by some now unknown genius for the subject of Fœtal Pathology.

"In point of interest," says Madge, who is one of the very few English investigators who have striven to attract the attention of the profession to this line of research, "it certainly yields to no other subject: here we retrace our own development into existence, microscopical germinal spots, swelling their proportions and budding into life; the vital spark instilling itself into organized matter, and conducting it with a flickering flame through the period of gestation, and all this amidst accidents and impending causes of dissolution which very often deprive the new being of its precarious existence." *

* Madge (Henry), *The Diseases of the Fœtus in Utero*, p. 5. London, 1854.

With regard to the importance of a study of ante-natal diseases it is simply impossible to predict what results, beneficial not only to the individual but also to the race, may not flow from discoveries in this field of research. For from such discoveries there would arise in time a system of ante-natal therapeutics, prophylactic and curative, which, when perfected and rigorously carried out, would abolish fœtal and congenital disease altogether. Did we, for instance, know the etiology of congenital malformations, we might be able to devise preventive measures, and so save many lives and prevent an increase in the number of comparatively helpless or hopelessly maimed human beings existing in the world. The benefit that would ensue to the human race would be incalculable if it could ever be brought about that all infants should be born into the world strong and healthy, and free from hereditary taints. The individual would still be liable to injuries and diseases during life, but he would be free from pre-existing debilitating diatheses and dyscrasiæ, and would, therefore, be better fitted to resist morbid influences, and better able to recover from the effects of traumatism or disease. Such a change could not, of course, be brought about in a single generation, even if the causes of fœtal diseases were known and means of counteracting them discovered, for in order to banish the hereditary tendencies in the infant healthy parents would have to be postulated. At the same time it is not just to stamp the whole subject as visionary and unpractical, for to a certain extent, and with certain diseases, it has been demonstrated that it is possible to develop a rational system of ante-natal therapeutics. Intra-uterine syphilis is a case in point. The physician who has diagnosed the existence of syphilis in a married couple is able to assure them that if they will but adopt certain prophylactic measures, if they will put themselves under a rigid anti-syphilitic treatment with mercury, they will sooner or later be rewarded by the birth of a healthy infant. Even if there exist in utero a fœtus presumably already affected with the syphilitic taint, it has been shown that the administration of mercury to the mother, and through her to the unborn infant, will have a beneficial effect, and may ward off a miscarriage, although it may not suffice to lead to the production of a living infant. Again, in certain cases, it has

been shown that the administration of chlorate of potash to the mother during her pregnancy may be of such service as to enable her to give birth to a living healthy infant, although all her former gestations terminated with distressing regularity in abortions. Other means of dealing with congenital morbid states will be referred to later, but such are some of the measures which a study of fœtal disease has already placed in our hands wherewith to combat intra-uterine maladies; and in many other directions we may look for further advances in treatment, the direct results of discoveries in etiology. A certain amount of progress has already been made along the lines above indicated, and there are hopeful indications that we may erelong be able successfully to cope with many fœtal pathological states at present beyond our reach.

So far only the general importance of a study of fœtal disease has been emphasized, and it has been shown that the subject has claims upon all who are interested in the progress of medical science and in the discovery of new weapons wherewith to combat disease and death. It is scarcely necessary to say, however, that it has special attractions for those who are engaged in certain departments of practice and research. The obstetrician cannot fail to be interested in fœtal pathology and teratology, for it is into his hands that specimens illustrating these conditions in the first instance pass, and he has the opportunity, denied to others, of watching the effect of ante-natal disease upon pregnancy and labour, of noting the condition of fœtal vitality before and after birth, and of examining the placenta, membranes, and umbilical cord. In the next place, the pediatric physician or surgeon who is called upon to treat congenital morbid states, and who is able to watch the effects of fœtal disease upon the condition of the infant and young child, must find his attention constantly drawn to these subjects. The medical jurist, also, from the requirements of his special branch of practice, must be well acquainted with all that pertains to fœtal life and health: he may at any time be called upon to give evidence on such knotty points as criminal abortion, infanticide, live-birth, and the like, and must be prepared to differentiate between the appearances that are normal and those that are morbid or due to violence in any given

case. To the biologist and embryologist, also, the study of fœtal diseases is of value and has an interest, for it often serves to throw light upon the intricate problems of development and of physiological processes. Finally, the subject ought to prove an attractive one for the pathologist, for it is possible, and even probable, that the secret of the ultimate causes of diseased processes lies hidden in the morbid states of the fœtus; at any rate it is possible to study disease in its earliest and simplest manifestations in the embryo, and it may be found that as deformities of the fœtus in the lower animals have been produced artificially by altered environmental states, so diseases may in some like manner be induced experimentally in, for example, the case of the chick. If this can be done, it cannot fail to elucidate the problems of pathology in the human subject.

Some of the methods and means by which fœtal maladies can be investigated may now be detailed.

I.—Description of the Fœtus.

In the first place, specimens illustrating fœtal disease or malformation ought to be looked for, and, when found, ought to be thoroughly dissected. The post-mortem examination of fœtuses, of still-born infants, and of new-born infants who succumb within the first weeks of life, is a means of observation to which the attention of the medical profession has not yet been sufficiently directed. Dr Stokes, writing more than fifty years ago, said, "I believe that anyone who has the opportunity of dissecting a great many still-born children, or of those who die immediately after birth, would, by examining the state of the different cavities, and publishing the results of his examinations, earn for himself very great reputation." If this advice had been more widely followed much more would at the present day have been ascertained with regard to fœtal pathology; when it has been carried out it has never failed to yield important information. *The same remarks apply even more forcibly to the examination of early abortion sacs.* The description of a diseased or malformed fœtus ought to be thorough, and take notice of the following points:—

a. The External Appearances of the Fœtus.—In some diseases, such as congenital ichthyosis, congenital elephantiasis, fœtal

dropsy, and in most malformations, *e.g.*, cyclops, anencephalus, exomphalos, the external appearances are very evident and very characteristic. These should be fully described, and in addition a good water-colour sketch or two ought to be made. This should be done whilst the specimen is fresh, for after it has been allowed to lie in spirit for some time its colour, and also to some extent its size and form, are altered. If a drawing cannot be obtained, a photograph may be taken, which will serve to show all the external characters of the specimen save the colour.

b. The Internal Appearances.—It is not sufficient simply to depict or photograph the external characters of a specimen, the internal also are of great interest. In the case of such forms of fœtal monstrosity as the peromelous or phocomelous, the anencephalic, and the cyclopean, it is not uncommon to find that no dissection has been made. They have been bottled and catalogued, and placed upon the shelves of some museum, private or public. Sometimes that even has not been done, and they have either been destroyed or kept in the medical man's own possession for the benefit of his professional friends alone. In this way much information of a valuable kind has no doubt been lost to science. It may, however, be urged that the dissection of an anomalous fœtus destroys its external appearances; but if a sketch or photograph have been previously made this objection does not hold good, and it matters little what becomes of the specimen. More than this is possible. If it be absolutely necessary that the external appearances be preserved, this can be done and the dissection also carried out. The following method, which I have used in several cases, may be adopted. The skin must be carefully removed from the surface of the trunk and limbs, it must then be stitched together and stuffed with horse hair and cotton wool, and it is then found that the specimen, *minus* skeleton and viscera, shows almost, if not quite, as well as before the general appearance, whilst the bones and organs have been rendered available for dissection. A peromelous fœtus treated by me in this way is now in the Obstetrical Museum of Prof. A. R. Simpson, to whom I am indebted for the suggestion of the method above described.

In the case of some teratological conditions the external

appearances do not differ from the normal, and but for dissection might never be discovered. It is thus with many anomalies in the form of the viscera, with the curious cases of transposition or situs inversus, with diaphragmatic herniæ, etc.

Again, in the case of many fœtal diseases a full dissection is absolutely necessary to make clear their pathological nature. It is wise to make post-mortem examinations of all dead or still-born infants and fœtuses, whether these show any external diseased conditions or not. The routine practice of making such autopsies could be carried out without much difficulty, save in the cases where objection was made by the parents, and in this way many obscure cases of fœtal disease might be cleared up. Especially is this true of infants that have died at or soon after birth.

c. The Relation of the External to the Internal Appearances.—A word or two may here be said with regard to another method of investigation which may in conjunction with dissection yield good results in the study of fœtal disease and infantile death. The frozen sectional process is the method now alluded to. By this means the relation of the internal organs to the surface landmarks can be accurately fixed, and a more complete conception of the morbid condition arrived at. I have employed this method of investigation in the case of several diseases and malformations, and it might with profit be extended to the study of several others. In the case of anencephalic and exomphalic fœtuses I have thus been enabled accurately to define the displacement of the viscera in the regions of the neck, thorax, and abdomen; and with regard to general fœtal dropsy, it has made it possible to demonstrate the position of the fluid in a way that no other means could have done so efficiently. The method is a little more difficult of execution than is simple dissection, but the results obtained are well worth the extra labour involved.

d. The Microscopic Appearances.—It is scarcely necessary to add that the microscopic investigation of the diseased tissues is as important in the fœtus as in the adult, and ought on no account to be omitted. In the case of monstrosities the histological characters of the viscera have not hitherto been extensively inquired into, but it is more than likely that in them also such researches would be most fruitful in results, for it can scarcely be

believed that where gross anomalies exist there will not also be found microscopic changes.

e. The Presence of Micro-organisms in the Fœtal Tissues.—Bacteriological investigations have as yet been seldom carried out in connexion with fœtal diseases; but their value is manifest, for since it is probable that a healthy fœtus is entirely free from the presence of microbes, their discovery in any case would be of immense etiological importance.

f. The Chemical Characters of Fluids, etc.—In some instances, as in fluid effusions and cystic accumulations, chemical analysis will be of service in estimating the nature of these products, and in throwing light upon the character of the malady of which they are the physical expression. I have proved its value in the case of general fœtal dropsy.

II.—Description of the Fœtal Annexa.

It should never be forgotten that the membranes are fœtal structures, and that one-half of the placenta takes its origin in the chorion. This being so, it is of great importance in every case of fœtal pathology to ascertain the condition of the chorion, amnion, and placenta. Too often, unfortunately, no reference is made to any such examination; frequently the after-birth has been destroyed at once, and no notice taken of its characters. A diseased fœtus without its placenta is an imperfect specimen, and a description of a fœtal malady, unless accompanied by a notice of the placental condition, is incomplete. Deductions drawn from such a case cannot be considered as conclusive, for in the missing placenta or cord may have existed the cause of the disease and death. During intra-uterine life the fœtus, the membranes, the cord and the placenta form an organic whole, and disease of any part must react upon and affect the others. The same remark applies to the liquor amnii. The annexa, therefore, must be examined both by the naked eye and microscopically in every case in which it is possible so to do. Examples of the way in which morbid states of the annexa produce abnormal conditions in the fœtus are numerous: the influence of amniotic bands, of knots, twists, and convolutions of the cord, of chorionic cystic changes, and of placental disease is so widely recognised that it only requires to

be mentioned here, and the curious association of hydramnios with so many morbid fœtal states is a most interesting fact.

III.—The Clinical History and Symptomatology of the Case.

Another line of research in connexion with fœtal pathology is to be found in the inquiry into all the medical and obstetrical circumstances of the case. In importance this method is second only to the examination of the fœtus and after-birth. It must, however, be admitted that occasionally perfectly healthy mothers give birth to diseased or deformed fœtuses, and that sometimes normal infants are born to mothers suffering from serious illnesses. In such cases the investigation of the clinical history of the patient may have no very evident value, but the inquiry is not on that account to be abandoned, for so little is yet definitely known with regard to the effect of disease in the parents upon the fœtus, and of fœtal maladies upon the health of the mother, that in each instance a searching examination ought to be made of the medical history of the parents and of the obstetrical record of the mother. It is probable that if this examination were carefully made, facts of the greatest interest would in nearly every case be forthcoming.

It is well that the following matters be inquired into in all instances of ante-natal disease or deformity.

A. *Maternal History.*

1. *General.*—There are certain matters connected with the clinical history of the mother that ought to be investigated in all cases of fœtal disease. Their relationship to the fœtal morbid process may not be very clear; but it is of importance in such an intricate subject to secure all the available information. Reference is now made to medical conditions of the mother existing apart from the pregnancy of which the abnormal fœtus is the result, and to conditions, therefore, which if they have been active at all must have influenced the unimpregnated ovum in the ovary and through it, when fecundated, the fœtus. It must at the same time be admitted that it is nearly impossible to state whether in any given case the morbid tendency pre-existed in the ovum before impregnation, or was impressed upon it at the time of conception or during pregnancy.

Among the questions to be inquired into are the mother's age, height, weight, and general development, for it is probable that the ova of very young or very old mothers may be inherently less strong and healthy than those of women in their prime, and that the inferior or superior state of development of the maternal organism may influence the size, weight, and health of the fœtuses that are produced. Hecker, Duncan, and Irme have shown, at any rate, that the weight of the infant at birth increases up to a certain point with the increase in age of the mother, and that there are certain years in her life when the likelihood of a heavy child's being born is very great. The height, weight, etc., of the mother ought certainly to be noted in cases where very small or very large infants are born.

It is very probable that the condition in life and the habits of the mother profoundly influence the health and development of the ovum and fœtus. It has been stated by several observers that fœtal diseases are rarely seen in the case of healthy, robust women living in comfort, whilst they are more frequent in mothers supplied with insufficient or poor nourishment, exhausted by excessive fatigue, or crushed with sorrow, shame, misery, or anxiety; and it is admitted that the malign influence upon the fœtus of the alcoholic and other vicious habits of the mother is undoubted, although its *modus operandi* may not be understood.

The constitution and temperament of the mother may also affect the condition of the fœtus. A highly-strung nervous system or a hysterical temperament I have sometimes noted in conjunction with the production of fœtal deformities.

The maternal medical history as regards the diseases of infancy, childhood, and adult life ought to be inquired into. The occurrence of rickets, convulsions, fevers, etc., in early life, and the presence of syphilis, anæmia, hepatic and renal disease, diabetes, lead-poisoning, etc., in later life, are factors whose influence upon the fœtus in a direct way or through its annexa indirectly must be taken into account.

Maternal deformities ought also to be noted, for such are sometimes directly transmitted, as in certain cases of supernumerary digits, hare-lip, etc. That *acquired* deformities may become hereditary is very doubtful—their transmission is denied by

Weissmann and others—but their presence should be noted in order that statistics may be obtained for the settlement of the question.

2. *Sexual and Obstetrical.*—The investigation of the sexual and obstetrical history of the mother often yields more directly valuable indications with regard to the causes of ante-natal disease than does that of the purely medical record. There is a connexion between the whole of the mother's organism and that of the unborn infant; but there is a much closer relationship between the uterus (with its contained circulating blood) and its fœtal contents.

The mother's menstrual habit and type, therefore, ought to be ascertained, and any abnormal conditions, such as excessive or diminished flow, pain, etc., noted, for from such information something may be learnt of the state of the genital organs and their fitness for the discharge of the reproductive functions. It is difficult to obtain satisfactory statistics bearing upon the question whether the married or single condition of the mother influences the health of the fœtus; but when it is borne in mind that a woman pregnant with an illegitimate child must of necessity be placed under less advantageous circumstances than her happier married sister, it seems likely that the fœtus in utero may suffer therefrom. The question of the effect of consanguinity is a moot point; but it is not to be neglected on that score. The age at which the married state was entered into is also worthy of note.

Grave diseases and anomalies of the uterus, ovaries, and tubes, usually render the patient sterile, and this means that these organs are unable to perform the functions necessary for the occurrence of conception and for the progress of fœtal development, or that the ova in such cases are destroyed or rendered incapable of healthy fecundation. In less serious maladies affecting the maternal genital organs, conception and some degree of development may take place; but from inherent morbidity in the ovum, or from pathological conditions of the uterus and fœtal annexa, gestation is brought to an untimely end in miscarriage or premature labour. It may be conceded that a diseased uterine mucosa cannot grow a healthy placenta, and in this way a morbid state of the uterine contents may be brought about. Maladies of the mother's pelvic viscera ought, therefore, to be investigated.

If the mother be a multipara, the history of the details of her

previous pregnancies must be gone into. Such matters as the number of gestations, the rapidity with which they followed each other, and the history of abnormal symptoms during their course, should be investigated, for fœtal diseases are prone to repeat themselves in successive pregnancies, and the history of the past may often serve to elucidate the present condition. It is especially important to elicit facts bearing upon the occurrence of abortions or of plural conceptions.

The pregnancy whose product is the diseased or malformed fœtus must be most closely investigated. Every detail in which it differed from the normal should be noted. *First*, the condition of the mother during the gestation is of vital importance. She may have suffered from an infectious fever, and this may explain the conditions found in the infant at birth, or may supply the cause of abortion. The residence of the parent in a locality where, for example, smallpox is prevalent may be sufficient to cause that disease in the fœtus, the mother herself enjoying the immunity which has been conferred upon her by vaccination or by a previous attack. Any other affection which may have occurred during pregnancy, such as renal, hepatic, gastric, pulmonary, or mental disorder, should be inquired into, as it may serve to throw light upon the abnormal intra-uterine conditions. The connexion between albuminuria and placental disease is a case in point. The history of maternal impressions also ought to be critically scrutinised. Again, the occurrence of traumatism during pregnancy may serve to explain some cases of fœtal disease and death, and the administration of certain drugs to the mother in the course of her gestation may be the exciting cause of tissue-changes in the fœtus.

Second, the physician should note the history which he may obtain of any deviations from the normal in the symptomatology of the pregnancy. The character of the fœtal movements, the rate of the fœtal heart, and the evidence of a large or small quantity of liquor amnii, are points which should be inquired into. Sometimes a distinct history of the signs of fœtal death may be forthcoming, such as cessation of fœtal movements, stoppage of heart-beats, feeling of weight and cold in the lower part of the abdomen, retrogressive changes in uterus and mammary glands,

and peculiar sensations experienced by the mother. At other times weakness of the fœtal movements has been present, and it has been found that a weakly infant, or one with partial or complete absence of the limbs, has been born. Sometimes the movements of the infant in utero have been violent and tumultuous, and fœtal shiverings from malaria, or convulsions from brain-disease, have from this sign been diagnosed. Irregularity in the rate of growth of the uterine tumour has occasionally been noted, and has led to the diagnosis of myxomatous degeneration of the chorion, hydramnios, etc. It is only by the careful recording of such circumstances that we can ever hope to build up a system of fœtal symptomatology.

From the history of past confinements information may often be gathered which is of value in connexion with the understanding of fœtal disease. The records of tedious, instrumental, or complex labours, of the birth of still-born or dead infants or of twins, and of abnormal phenomena in the third stage of parturition, ought to be carefully scrutinised. It is sometimes found that fœtal morbid states have a tendency to be reproduced in successive pregnancies, and from a history of past confinements one is often able to trace such a repetition of diseased manifestations varying frequently in intensity. This is especially true of syphilis. So marked is this tendency that it has been customary to speak of habitual abortion, habitual premature labour, and habitual fœtal death, although it is doubtful whether the idea of habit suggested by the name is a correct one.

Of course, all the clinical details of the confinement which terminates in the birth of a morbid fœtus are of immense importance. The infant may be alive and healthy before labour sets in, and may yet die or suffer injuries leading to disease during the process of birth. Again, certain pre-existing fœtal maladies, such as ascites, congenital tumour-growths, hydrocephalus, and some monstrosities, may seriously interfere with the process of parturition,—so much so as sometimes to necessitate operative interference entailing the death of the infant. The history of the confinement, therefore, is important, and so also is that of the puerperium, for it may be found that certain abnormal conditions, *e.g.*, albuminuria, dropsy, etc., found during pregnancy rapidly dis-

appear after the birth of the child, and were perhaps due to the fœtal disease or to the distension of the uterus during gestation.

The history of the pregnancies and confinements which follow the birth of a deformed or diseased infant is a matter with regard to which little information is forthcoming in the great majority of recorded cases. The after-history of all such cases ought, however, to be followed up, and is of great interest when narrated. When a woman gives birth to an abnormal fœtus, means ought to be taken to prevent the recurrence of such an event, and the success or failure of such means will be manifested by the history of the succeeding gestations. In this way it is possible to look for an augmentation in number of the therapeutic measures which are of value in intra-uterine disease.

B. *Paternal History.*

In the great majority of the recorded cases of fœtal disease nothing is stated with regard to the health of the father. This is unfortunate, for it seems to be certain that paternal morbid states acting through the spermatozoon are potent in inducing disease and deformity in the fœtus. I myself have seen some cases in which I believe that I was able to trace to the father the origin of the ante-natal malady of the infant. The age of the father, his degree of development, his habits, especially the alcoholic, and certain diseases—such as syphilis, nephritis, diabetes, cancer, tuberculosis, lead-poisoning, mental disorder, etc.—from which he may suffer ought to be noted in all cases of intra-uterine disease. It is impossible yet to foretell how far such inquiries may yield valuable results.

C. *History of the Infant.*

It is almost unnecessary to say that when the morbid infant survives its birth all the details of its symptoms should be noted, and a record of its appearances made. Certain malformations lead to injurious and evident results only after birth. The imperforate condition of the anus, absence of the common bile-duct, congenital heart-disease, the existence of hare-lip and cleft-palate are cases in point. Further, should twins be born, one healthy, the

other diseased, deformed, or dead, the clinical history of the survivor may be of some interest.

D. *Family History—Heredity.*

Certain malformations and some fœtal and congenital diseases are known to be hereditary; and it will be well in all cases to inquire into the medical history of grand-parents, uncles and aunts, etc., for an inherent morbid tendency may not manifest itself in each generation, or, indeed, in each individual of the generation. The study of the phenomenon known as atavism has already thrown light upon certain congenital anomalies, and results of great value are to be looked for in this direction. In the case of some diseases, *e.g.*, hæmophilia, it would seem as if the morbid tendency remained latent in the female until the supervention of pregnancy, and that then it appeared, but only in her fœtus if a male, and not in the other parts of the maternal organism. "It would be an advantage," says Cooke Hirst,* "to begin the observation of the fœtus, as well as its treatment, a hundred years before its procreation, in a study of antecedent generations." Finally, in connexion with the investigation of the medical history of the ancestors of the fœtus in any given case, it must not be concluded that want of identity of morbid process means independence, for it would seem that one disease in the mother may give rise to another in her offspring.

It may be useful if I here summarize, in the form of a case-taking scheme, what has been said in the preceding pages. I have found the scheme of great help when dealing with fœtal diseases, and trust that it may be of some use to other workers in this field of research.

I. Clinical History and Symptomatology.
  A. Maternal.
    1. General.
      a. Age, development, weight, etc.
      b. Habits and environment.
      c. Constitution.
      d. Diseases.
      e. Deformities.

* *American System of Diseases of Children*, vol. i. p. 235, 1889.

2. Sexual.
   a. Menstruation: type, habit, etc.
   b. Marriage: early or late, etc.
   c. Morbid states of uterus and annexa.
   d. Pregnancies.
      (1.) Past: number and character of.
      (2.) Present: character, twin or single, etc.
         Symptoms in Pregnancy—
            α. Maternal: gastric, renal, nervous, and other derangements.
            β. Fœtal: movements, heart-beat, etc.
   e. Labours and puerperia.
      (1.) Past.
      (2.) Present.
   f. Later sexual history (after birth of diseased fœtus).

B. Paternal.
   History of father's health, constitution, habits, etc.

C. Infantile—(when the infant is born alive and survives for a longer or shorter time, or when there are twins of which one lives.) Symptoms of disease in the various systems, especially in that obviously affected.

D. Family history—heredity.

II. Morbid Anatomy.
   A. Of fœtus.
      1. External appearances.
      2. Internal appearances—dissection.
      3. External and internal appearances — sectional method.
      4. Microscopic appearances.
      5. Bacteriological investigation of tissues.
      6. Chemical characters of fluids, etc.
   B. Of fœtal annexa.
      Macroscopic and Microscopic characters of—
         1. Placenta.
         2. Umbilical cord.
         3. Membranes.

(1.) Chorion.
(2.) Amnion.
4. Liquor amnii.

C. Of mother (if the birth of diseased infant be followed by the death of mother).

IV.—Experimental Methods of Research.

The lines of research which have been already indicated are such as can be pursued by every medical man. Dissection, microscopic examination, and the inquiry into the history of the mother's pregnancy and family health record are means of investigation open to all. From sources not so generally available may be expected much that will be of interest in elucidating the problems of fœtal pathology. I allude to the experimental methods of investigation. By means of vivisection some light has been thrown upon the vexed question of the passage of solid particles, such as medicinal substances and micro-organisms, through the placenta from the maternal to the fœtal blood. Various experimenters have made such investigations upon pregnant animals, and although all are not agreed as to the possibility of the transmission of bacilli from mother to fœtus, still much has been done to render more clear our conceptions regarding intra-uterine infectious diseases, such as variola, erysipelas, septicæmia, etc. Experiments with a view to determining the effect of maternal pyrexia upon fœtal health have also been carried out, and the results obtained, although in some measure contradictory, have been of value.

Along another line research has of late years been busy. Saint-Hilaire, Liharzik, Valentin, Gerlach, Lombardini, and especially Dareste, have done much to establish on a scientific basis the department of experimental pathology known as teratogenesis, or the artificial production of monstrosities. The eggs of various animals have been subjected to abnormal environmental conditions during incubation, and various structural anomalies have been produced in this way.

No doubt the experimental methods will, in the future, shed still greater light than they have done upon the vexed questions of fœtal pathology. Much remains to be discovered by future workers in this field of research.

PART I.

DISEASES OF THE FŒTUS.

CHAPTER III.

THE DISEASES OF THE FŒTUS.

HISTORICAL SKETCH: AMONGST PRIMITIVE PEOPLES; AMONG THE EARLIEST CIVILISATIONS.

That the unborn infant is sometimes the subject of disease, deformity, or death, is a circumstance which must in all ages have been observed. Yet until comparatively recent times little had been written upon the diseases of the fœtus, and, indeed, the older authors did not, with rare exceptions, investigate morbid intra-uterine states with that degree of thoroughness which they in many instances employed in their examination of the diseases of adult life. It may be affirmed that the writings of many of the ablest physicians of antiquity, and of most of the medical men of the Middle Ages, were absolutely barren of any information bearing upon this branch of medical study. It will be the purpose of the following pages to give a short historical sketch of the growth of knowledge concerning diseases of the fœtus, whilst at a later stage similar sketches will be given dealing with the history of fœtal malformations and of diseases of the fœtal annexa.

Fœtal Diseases among Primitive Peoples and Savage Races.

It is probable that the habits and customs of savage races now existing in various parts of the world closely resemble those of the nations of antiquity before their emergence from barbarism into that civilisation which has been revealed through their historic annals. Our only hope of obtaining any idea whatever of the views held with regard to diseases of the unborn infant in prehistoric times is contained in the investigation of those that have been held by primitive peoples either now living on the earth, or having but recently passed away.

Since in the case of savage tribes the care of the pregnant and

lying-in woman is entirely in the hands of women with little or no special knowledge on the subject, since the value placed upon fœtal and infantile life is usually insignificant, and since all their medical beliefs and practices are mainly founded upon the grossest superstitions, it is not to be expected that much attention will be paid by them to diseased states of the fœtus. Hints are, however, not wanting which suggest that fœtal maladies were not unknown among such people, and that they were usually ascribed to supernatural agencies such as witchcraft.

Thus it is stated in Engelmann's work,* that amongst the Loango-Negroes whilst "twins and triplets are not killed, deformed children are quickly put aside; such as have only slight deformities are sometimes permitted to live; but even a mother's love cannot save them in case that popular feeling should be such as to consider them, for some reason or other, as possessed of witchcraft. It depends merely upon an accidental combination of circumstances whether an ill-formed child is doomed as a "ndodschi" (deformed bearer of misfortune), or simply as a "muana-mu-bi" (ugly, bad child); no fault is found with the mother. This superstition may go so far as to accuse a still unborn child; the mother is then given a poison bark, in the firm belief that the "ndodschi," if such a one exists, will be rendered harmless by being aborted." They also forbid pregnant women to drink rum lest the child should be marked,† and in this we may admire their care even if we do not share their dread. Engelmann also has pointed out that umbilical hernia is common among the newborn of the black races, and that vertigo, congenital and accidental, is frequently met with.

The beliefs of primitive peoples with regard to the condition and behaviour of the fœtus in utero are, as might be expected from their want of knowledge of anatomy and physiology, very vague and full of superstition. They usually regard the stay of the infant in its mother's womb as a purely voluntary matter, and resort to the expedient of putting the woman upon short commons for some weeks before labour is expected, so as to starve out the fœtus and make it willing to quit its maternal dwelling-place. This is, at

* Engelmann (G. J.), *Labour among Primitive Peoples*, p. 209, 1883.

† Peschuel-Lœsche, "Indiscretes aus Loango," *Zeitschrift für Ethnologie*, p. 17, 1878.

any rate, the custom among the Pahutes; it is shared by several other races, and was not unknown in Europe within comparatively recent times. It is, indeed, a widely prevalent belief, that the unborn infant has no insignificant power of retarding or expediting labour by its own voluntary efforts. If labour be seriously obstructed, the Papagos reason that it is better for mother, child, and tribe that the mother and child should perish, than that so villainous an offspring should be born and grow up to do injury to his people.* Again, the people of Haiti† tightly bandage the mother's abdomen during pregnancy in order to prevent the infant's rising up and taking the food from the stomach of the mother. The Esquimaux do not allow a pregnant woman to do hard work; she eats only of game killed by her husband and unwounded in the entrails. They appear to believe that the child would not really belong to the father if the woman were nourished by food supplied by some one else, and to think that an animal wounded in the entrails might sympathetically affect the mother's system.‡ This belief is shared in by other races as well as the Inoits. A curious custom, which would seem to indicate some little knowledge of fœtal life and health, is practised in Old Calabar. There, according to Hewan,§ medicines are regularly given at the third month to prove the value of the conception. Three kinds of conception are deemed disastrous: first, if resulting in twins; second, in an embryo which dies in utero; third, in a child which dies soon after birth; and it is to avoid the further development of such products that the medicines are given,—the idea being that if the pregnancy stands the test of these medicines, it is strong and healthy. In case the ovum is expelled it must have been one of the undesirable cases of which no good could have come. Should the pregnancy survive the ordeal, the mother is guarded from danger during the remaining term, and is often sent away at the seventh month to a quiet place where she can be free from excitement and out of reach of witchcraft. Abortions are often attributed to the evil-eye.

* Engelmann, *op. cit.*, p. 10.

† Witkowski (G. J.), *Histoire des Accouchements*, p. 632, 1887.

‡ Reclus (E.), *Primitive Folk*, p. 35.

§ Hewan (A.), *Edinburgh Medical Journal*, p. 222, Sept. 1864.

It is difficult to arrive at any certain results with regard to the frequency of abortion among savage tribes. From the healthy life led by such peoples it may be considered as probable that the premature occurrence of labour is uncommon; but it is almost impossible to form an opinion, for the practices of the artificial induction of abortion and of infanticide are so common amongst them as to overshadow the cases in which fœtal death is due to natural causes. In a report upon the Nomad tribes of Asia Minor* it is stated that among the Youruuks were found many instances of abortions in the shape of infants without arms, a wrong number of fingers, etc.; infant mortality was enormous among them; and a considerable percentage of idiots were noted, who were treated with superstitious care. Whatever may be the case with regard to natural miscarriages, it is well known that artificial abortion and infanticide are common practices amongst primitive peoples. The right of a mother to bear a child and to preserve it alive when born is in many cases decided mainly by the supply of food obtainable for its sustenance. As Reclus† has put it, "our ancestors did not admit that a new-born infant had a right to existence. The mother had let it fall to the ground; there it must remain until the head of the family . . . . either picked it up himself or permitted others to do so. Before he gave the sign the object counted as little more that a clod; it was as yet but so much organic clay." Further, when a woman found herself to be pregnant and saw that there was no probability that the infant would be a welcome addition to the family circle, she in many cases had recourse to the production of abortion. This practice exists at the present day amongst the Esquimaux, and in many parts of the world—in Central Africa for instance—abortion is provoked for various reasons. Some negro tribes make their women abort by striking them on the abdomen if they happen to become pregnant whilst lactation is going on. Other abortifacient means are employed by some of the North-Western tribes of Canada,‡ who give the pregnant woman the leaves of a species of *carex* to eat, and as the edges of the leaves are sharp, it is supposed that will

* *Report of the British Association for* 1890, p. 536.

† Reclus (E.), *op cit.*, p. 33.

‡ *Reports of the British Association*, 1890, p. 553.

cut and thus kill the embryo. The same tribe make their women, when at the ninth month of pregnancy, chew the *Sedum sputhifolium* every morning to facilitate labour. Sometimes more direct means are employed to induce a miscarriage, foreign bodies being passed into the vagina and cervix, as in Oceania.* It is unnecessary to say more with regard to the practice of abortion; it is very common among primitive peoples.

In Polynesia and elsewhere the father has the supreme right of killing or saving alive the new-born infant.† Sometimes it would seem that he exercises this right on the Spartan principle of preserving alive only those that are strong and likely to be of profit to the community. Among the Western Inoits (Aleutians) infants that wail are plunged into ice-cold water, and so only those are reared that are tranquil and robust (Reclus). The Todas of India, however, whilst they never kill the boys, often sacrifice the girls, and then only the sturdy and strong, not the weakly and deformed. The Caffres expose at once infants whose bodies exhibit any faults, just in the way that used to be done in ancient Rome.

Nearly all savage races agree in regarding the birth of twins as an event of great importance. The Ikungen, one of the tribes of North-West Canada, consider twins immediately after birth as possessed of supernatural powers, and they at once take them into the woods and wash them in order that they may become ordinary men. Many other curious customs and beliefs concerning plural births are found amongst these tribes: some of them consider that twins if of the same sex are salmon before birth; others that their appearance betokens a good salmon year; and others impose upon the parents of twins various troublesome ceremonies. In some parts of Africa the birth of twins is the signal for public rejoicings; but in others the mothers who give birth to them are sacrificed along with them. In Old Calabar twins are looked upon as monsters, and are destroyed by the mother herself (Hewan).

The Hottentots go so far as to deprive boys of one testicle, with the idea that they cannot then beget twins. In the Moluccas and other places it is believed that if pregnant women eat double fruits they will give birth to two infants. Is this a primitive form

* Witkowski, *op. cit.*, p. 638.

† Letourneau (C.), *The Evolution of Marriage*, p. 113, 1891.

of the notion regarding maternal impressions? It has been said by Patouillet* that plural births are unknown among the natives of New Caledonia; and it is at any rate very evident that twins are by all savage races looked upon with wonder, and are sometimes regarded as of good, sometimes of evil omen.

It is not known whether amongst primitive peoples the fœtus is especially liable to hereditary taints and diseases or not; but Engelmann seems to think that the *infant* at any rate is,—a fact which he is led to ascribe to the long period of nursing. It is well known that among the blacks the rate of infantile mortality is enormous, and it is terribly high in the case of other races also. Probably a great part of this death-rate is due to fœtal disease and weakness, although no doubt infanticide is a factor in its production which must not be overlooked.

A survey has now been made of some of the evidence relating to the occurrence of fœtal diseases among savage peoples, of some of their beliefs regarding the behaviour of the fœtus in utero, of certain of their customs during pregnancy, of the frequency of abortion, infanticide, and fœtal disease, and of the peculiar superstitions regarding twins; from this it can be gathered that no doubt fœtal maladies do frequently occur amongst primitive races, but that on account of the small value placed upon infantile life they are usually disregarded, save when so striking as to cause wonder, to suggest witchcraft, or to give indications of the work of supernatural agencies.

Fœtal Diseases among the Earliest Civilisations.

When the history of medicine among the Chaldeans, old Persians, Egyptians, Jews, Hindus, Chinese and Japanese is considered, it is found that amongst these peoples there existed a very considerable knowledge of diseases, and occasional references to congenital maladies are met with. The close union between religion and medicine which existed gave a colour to the views with regard to fœtal health and development, and we may conclude from many indications that the pregnant state and the birth of children were subjects which attracted these peoples by the mystery and wonder

* Patouillet, *Trois ans en Nouvelle Calédonie*. Paris, 1873.

surrounding them, whilst the appearance of a diseased or deformed infant afforded to the priests a ready means of divination.

1. The unexpected discovery of the royal library of Nineveh, and the decipherment of its tablets by such men as Sir Henry Rawlinson, George Smith, and François Lenormant, have served to throw a flood of light upon the medico-religious beliefs of the early Chaldeans and Babylonians. Diseases were looked upon as the results of the malignity of evil spirits and of the anger of offended deities, and were treated by the use of amulets and charms wherewith to outwit the demons, or by appeals for help addressed to the well-disposed rulers of the universe. From such beliefs and customs arose the system of Chaldean divination. In the tablets devoted to this aspect of Babylonian religion there is an extensive chapter on monstrous births. "Not only," says Ragozin,* "is every possible anomaly registered, from an extra finger or toe to an ear smaller than the other, with its corresponding presage of good or evil to the country, the king, the army, but the most impossible monstrosities are seriously enumerated, with the political conditions of which they are supposed to be the signs."

2. The Zend-Avesta, the reputed composition of Zoroaster, contains in that part of it called the Vendidad certain rules of medical practice. In some respects the old Persian medicine resembled the Chaldean, and in many of its precepts it was akin to the Jewish. Artificial abortion was forbidden. The presence of the lochial or of the menstrual discharge rendered a woman unclean, and intercourse during pregnancy and lactation was regarded as a sin. Menorrhagia was looked upon as due to a demon, and the woman was beaten in order to expel him (Haeser). Contact with a dead body was regarded as pollution, and therefore if a woman gave birth to a dead infant she was required to undergo certain elaborate purifying ceremonies (Baas).

3. The Egyptians have, like the Chaldeans, left us a medical literature which reveals the fact that they possessed a by no means insignificant amount of knowledge of the art of healing, surrounded, it must be confessed, by an enormous quantity of superstitious beliefs and practices. This literature is contained in the

* Chaldea, *Zénaïde A. Ragozin.* Story of the Nations Series. London, 1887.

"Hermetic Books," of which the papyri of Leipzig and Berlin have been preserved to us, and is probably the expression of medical practice in Egypt in the fourth millennium before the Christian era. But of Egyptian obstetrics and of their beliefs with regard to the fœtus little information is forthcoming. It is known that the people esteemed children a great blessing, and that "the cat-headed Pacht (Bubastis) and Ape were worshipped as the deities of parturient women and child-blessedness,"* and it is told us in the Sacred narrative that their women bore children with greater difficulty than the Hebrews, and were attended by midwives. The wholesale infanticide of males ordered by Pharaoh is noteworthy. The Egyptians discovered the existence of a fœtus in utero in the following way: 'if a woman takes a drink prepared from the herb Boudodou-Ka, and the milk of another woman who has borne a boy, and—vomits—she is pregnant; if only borborygmi result, she is unfruitful.'† The Ebers' papyrus also tells us that the prognosis is favourable if the new-born cry "ni," unfavourable if it moan "ba;" and that if the infant wail much it will soon perish, as will also be the result if it allow its head to droop. Of far greater value than these few references was the discovery in Hermopolis of a mummy anencephalic fœtus, to which reference will be made in the part of this work devoted to Teratology, for from it it may be learnt that the Egyptians noticed and preserved malformed infants, probably in this case, at any rate, regarding them as sacred.

4. The medicine of the Jews was in all probability founded chiefly upon that of the Egyptians and that of the Chaldeans, and later was drawn from Greek sources; throughout the Bible and the Talmud are scattered references to their beliefs and practices. In the Sacred narrative are found the records of twin confinements, difficult labours, abortions, etc., and in the Talmud are many curious statements with regard to the fœtus, some of which may here be given.‡ The Jews must have been familiar with comparative anatomy through the requirements of their sacrificial religious system, and evidence is forthcoming that the Rabbis made dissec-

* Baas (J. H.), *History of Medicine*, p. 14, 1889.

† Haeser, *Geschichte der Medicin*, vol. i. p. 53, 1875.

‡ Beugnies-Corbeau, *Archéologie Médicale*, Fasc. i. p. 57. Liége, 1891.

tions of the human body, and in one case of pregnant women-slaves, in order to determine when the sex of the fœtus could be first recognised. In the Ghemara it is stated that the woman who menstruates freely will be very fertile (for the menses are like leaven to dough), that the best time for conception is the end of the flow, that pregnancy lasts from 271 to 273 days, according as the semen has exercised its fertilising properties on the first, second, or third day (after the third day it dies), and that all the spermatic fluid is not needed for fecundation, but only the better part. The fœtus is described as lying folded together like a roll of parchment, the hands to the right and left, the shoulders and brow on the knees, the feet against the buttocks, the mouth shut, the umbilicus open. When born the mouth opens and the umbilicus shuts, if not it cannot live an hour. In utero it eats and drinks what its mother eats and drinks, but it does not excrete. The fœtus has wonderful intellectual powers, it can see what is going on in all the world, it has universal science,—in fact, fœtal life is the most delicious stage of existence; but at birth an angel seals its mouth and it forgets everything. During the first three months of pregnancy the fœtus inhabits the lower zone (pelvis) of the mother, in the next three the middle, and in the last three the upper zone; during the first period coitus is injurious to both mother and fœtus, during the second it is dangerous to the mother but good for the fœtus, and during the last it is profitable for both. Near the full term the infant makes a somersault, the head occupies the lowest position, and the face looks backwards in a boy, forwards in a girl. The human fœtus is the result of three agencies—the father, who supplies the white parts, brain, bones, nails, sclerotic, etc.; the mother gives the red, *i.e.*, the blood, which produces the skin, the muscles, hair, etc.; and the Holy Spirit provides the breath, soul, sight, hearing, speech, movement, etc. At death the Spirit takes back what he gave, and leaves to the father and mother their parts. In the Mischnah it is stated that before the fortieth day of pregnancy the fœtus has neither form nor sex; at the forty-first day it develops the latter if a male, but not till the eighty-first day if a female. Various explanations are given to account for the sex of the fœtus, *e.g.*, the time of ejaculation of the semen, the holding of the right or left

testicle, etc. The development of the fœtus was supposed to take place from the head: the upper and lower limbs originated in the seventh week; the genitals, mouth, nose, and eyes in the sixth week; and the first hairs after three or three and a half months.

The Rabbis were acquainted also with certain morbid fœtal states. Abortion they seem to have studied closely, and state that the sex of the aborted fœtus can be distinguished by a practised eye at two and a half months. Abortions are spoken of which resembled in appearance various animals; these may have been monstrosities; at any rate the Jews were acquainted with various abnormalities, such as absence of the limbs, imperforate anus, hypospadias, hermaphroditism, etc., which were ascribed to bestial intercourse, or coitus *cum diabolo*. Abraham and Sarah were regarded by some as of incomplete sex (tumtims).* Mention is made of the circumcision of hermaphrodites and of an operation for imperforate anus. Artificial abortion was forbidden. The infant born at the eighth month was not viable, although it was so if expelled at the seventh. Uterine moles were recognised, and in the Ghemara a test is given for distinguishing between an expelled clot composed of blood and one consisting of flesh. If the membranes came away within three days after a miscarriage, it was concluded that there was only one fœtus, that to which they belonged; but if they were expelled at the fourth day, a second fœtus was to be looked for. If a woman who has borne a viable child expel the placenta ten days afterwards, there has been only one child. The expulsion of one placenta preceding a fœtus and its normal annexa suggests the fact that another unobserved fœtus has been born. Cases of the retention of the placenta for twenty-three days, and of the birth of a second infant thirty-four days or even three months after the first, were admitted, although they were regarded as wonderful. When a woman died before delivery it was considered that her infant must have died previously, and that it could not legally inherit. A distinction was made between the red and white lochia—the former were said to continue for seven days after the birth of a boy, for fourteen after that of a girl, whilst the latter persisted for thirty-three days

* Hershon (P. J.), *Genesis with a Talmudical Commentary*, p. 251. London, 1883.

days after a male, and for sixty-six days after a female birth. Some vague ideas existed with regard to extra-uterine pregnancy. In a labour which could not be terminated naturally embryotomy was allowed, but it was forbidden if the greater part of the trunk or of the head was expelled, for the infant was then looked upon as born.

5. Indian medicine probably ranks next to the Chaldean, Egyptian, and Jewish in antiquity, and its precepts are found recorded in the Vedas. In these works are many indications which show that fœtal conditions were studied. It is stated, for example, that the children of very young mothers either die before birth or remain weak in body and spirit, that conception takes place most frequently at the time of menstruation when the os uteri "opens like the water-lily flower in the sunshine," and that the hard parts of the embryo arise from the semen of the father, and the soft from the blood of the mother.* If the semen predominated, a male child was produced; if the menstrual blood was in excess, a female resulted; and if both were equal, the infant was androgynous. Development seems to have been studied. It is stated that in the first month the embryo fixes itself; in the second it becomes oval or spherical; in the third five extremities, the head and limbs, are visible; in the fourth the heart appears; in the fifth the nose, mouth, eyes, thorax and abdomen are differentiated; in the sixth the intellect commences to be developed; in the eighth the fœtus becomes restless, but is not viable; in the ninth it is nourished by a vessel passing to its mouth from the mamma of the mother; in the tenth its intelligence awakens, it prays to God, and beholds the heaven, the earth, and the seven lower regions. Just before birth the fœtus turns a somersault and comes to lie with the head lowermost. The treatment of threatened abortion by cold applications is mentioned; one of the three causes of impossible labour is given as deformity of the head of the infant; Cæsarean section for the sake of the child is stated to have been practised when the mother died near term; and embryulcia is described as in use for the delivery of dead infants that could not be born naturally.

6. Chinese medical writings, although extensive and probably of great antiquity, contain little that is of interest concerning fœtal

* Haeser, *op. cit.*, vol. i. p. 33.

states. In a treatise on the pulse,* however, some extraordinary statements are made as to the possibility of diagnosing various intra-uterine states by feeling the radial artery. It is affirmed that not only do certain peculiarities in the pulse enable the Chinese physician to discover pregnancy and the sex of the fœtus, but also that they indicate the number of fœtuses in the uterus, the sex of each, and the age and probable termination of the gestation. In a curious paper, entitled "A Mythological Account of the Fœtus in the Womb," † are found some Chinese ideas of intra-uterine development. In the first month of pregnancy the infant is like the dewy pearl on the grass, for it is doubtful whether it will long remain; in the second it becomes a small moving body like a flake of snow; in the third it is converted into a viscous bloody substance, a mole of blood, six inches and three-tenths in length; in the fourth the four members, first the two arms, then the two legs, are produced; in the fifth the five embracers, the vault of the skull, the shoulder blades, and the knee-pans appear; in the sixth the six radices—the eyes, ears, nose, mouth, body, and thought—are formed; during the seventh seven kinds of bones and branches are found; in the eighth the fœtus is said to suffer in eight different ways, when the mother eats anything hot, cold, or hard, when she is full or hungry, when she walks, sits, or bows her head; in the ninth the body of the child is turned three times; and in the tenth the infant consolidates day by day and indurates in the womb. A good and filial child leaves the mother's womb in the time in which a man rubs his two fingers one upon another, for the Chinese, like certain primitive races, look upon the fœtus as the active and the woman as the passive agent in parturition. The diagnosis of the sex of the unborn infant was easily made; seven was multiplied by seven, from the result was subtracted the number of years that the woman had lived, and to this result was added nineteen plus the figure indicating the month of the year in which the infant was conceived. If the number thus obtained was odd, the child was a male, if even, a female.‡ The death of the fœtus in utero is regarded as certain

* *Vide* Louge (P.), *Le Pouls Puerpéral*, p. 10. Paris, 1886.

† *Indo-Chinese Gleaner*, No. 20. April, 1822.

‡ Rodet (P.), *Accouchements chez les Peuples Primitifs*, p. 359, 1886.

if the mother's face be red and her tongue green! An old Chinese commentator explains that the education of the fœtus in utero ought to be carried out carefully, and states that the mother by obeying certain rules of conduct can insure the health of her unborn offspring; if, however, she neglects these rules, the infant may be born with five different kinds of disease, each of which has been produced by the violation of one or other of the injunctions. It may be diseased because the mother has not abstained from coitus during pregnancy, because she has given way to anger, because she has partaken of highly spiced food, etc.

7. The modern Japanese have rapidly adopted Western ideas upon medical as well as upon other scientific subjects; but in old Japan the beliefs were very similar to those found among the Chinese. Some hints as to the views held by the Japanese regarding the fœtus may be obtained from the following practices, till recently in use amongst them. At the fifth month of pregnancy the mother's abdomen was tightly bandaged to impede the growth of the child and so render labour easier. From the sixth month of gestation onwards a peculiar form of abdominal massage is practised with a view to the correction of wrong positions of the fœtus. The Japanese have evidently a belief in the potency of maternal impressions, for during pregnancy the women avoid all unpleasant sights, sounds, and conversations, and do not eat of rabbit or hare for fear of the production of harelip in the child.

It will have been gathered from what has been said with regard to the knowledge of fœtal states possessed by such ancient races as the Egyptians, Jews, and Chinese, that whilst there are signs of close examination into such matters, still the backward state of the other branches of medicine was such as to prevent any very useful deductions from being drawn. Further, the association of religion with the art of healing, and the fact that obstetrics was left in the hands of women, served to surround the subject of ante-natal states with great mystery and to retard progress. Still there are visible traces of later doctrines, and that ever interesting question of the power of maternal impressions seems to have been considered and answered in the affirmative. There is also sufficient evidence to show that abnormal conditions of the new-born infant were not allowed to pass unnoticed.

CHAPTER IV.

HISTORICAL SKETCH OF THE DISEASES OF THE FŒTUS—Continued.

AMONG THE GREEKS; AMONG THE ROMANS; IN THE MIDDLE AGES.

Fœtal Diseases among the Greeks.

1. In the early Greek writings are found many very interesting references to the fœtus and its diseases. Of Greek medicine prior to Hippocrates little is known; but no doubt much that is contained in the writings ascribed to the Father of Medicine was a patrimony from more ancient times. A little information is forthcoming with regard to the fœtus, and the problem of the determination of sex is found perplexing the minds of the philosophers of that time just as it does still. Empedocles of Agrigentum (504-443 B.C.) asserted that the sex of the embryo was determined by the predominance of heat or cold in the parents; whilst Alcmœon of Crotona (500 B.C.) believed that the parent who supplied most semen was the deciding factor in the matter. The former writer gave to medicine the terms chorion and amnion, and the theory of fœtal nourishment through the umbilicus. Pythagoras (580-489 B.C.) and his pupil Alcmœon believed that both parents furnished semen, that it came from the brain, and that it was the foam of the noblest blood. The latter writer also thought that the head of the embryo was the part first developed.

2. Such was the heritage of views concerning fœtal life into which Hippocrates and his followers came, and it is easy to see that their opinions were greatly influenced by it. Hippocrates (*b.* 468 B.C.) treats of many interesting congenital conditions in the works which are usually regarded as genuine; but it is from the treatises written in all probability by his pupils that most is learnt with regard to the fœtus. Thus, in the writings entitled "De Semine," "De Natura Pueri," "De Septimestri et Octimestri Partu," "De Super-

fœtatione," and "De Morbis Mulierum," none of which are usually looked upon as genuine, are found the views of the time concerning fœtal life and development. It is discovered from them that it was believed that by holding one testicle the sex of the embryo could be determined,—that the female semen for boys was performed in the right, and that for girls in the left ovary; that the male semen, therefore, acted only as an excitant to development, and that from the complexion of the mother the sex of the fœtus in her uterus could be ascertained. The view was held that the semen was collected from all parts of the body, and that, therefore, if any mutilation exist in the parent the fœtus will be similarly deformed. It was believed that the unborn infant by its movements was the prime factor in parturition, and it was therefore erroneously concluded that boys, on account of their greater strength, would be more easily born than girls, and that labour with a dead fœtus would be very difficult and dangerous. The child, if born at the seventh month, was held to be viable, but not if at the eighth, probably because the eighth month was regarded as a time of unrest and illness for the fœtus, which was therefore less capable of surviving the shock of birth at that time than in the more quiescent seventh month. Perhaps the mystic character ascribed to the number seven may also have had something to do with this belief, which proved one of the most enduring handed down to posterity. It was thought that the fœtus was nourished by sucking the cotyledons of the placenta, although no reason is given to explain how it happened that the human placenta was regarded as possessed of cotyledons. The parts of the fœtus were supposed to be visible as early as the seventh day. The uterus was looked upon as divided into two pouches: in the right one a male fœtus was conceived, and in the left a female. This supposition influenced the Hippocratic views concerning twin pregnancies and superfœtation.

Such were some of the opinions of the Hippocratic writers with regard to the physiology of generation and of the fœtus. Allusions to morbid intra-uterine states are found not only in the treatises above mentioned, but also in those which are regarded as genuine productions of the Father of Medicine himself, *e.g.*, "De Aeribus," "Aquis et Locis," "Aphorismi," "Prognostica," "De Articulis," etc. Congenital diseases were recognised ("De Humoribus"), and

were ascribed to disorders of the fœtal system in the eighth month and maternal fancies. Thus it was said that when pregnant women longed for cinders, the appearance of these things was to be seen on the infant's head ("De Superfœtatione"). The extraordinary statement was made that tape-worms always arose in the fœtal state, because the intestines were then in a quiescent condition! The various causes that may lead to abortion are well described in the "Aphorisms;" amongst them were reckoned purging in the early and late months, bleeding, diarrhœa, erysipelas, emaciation, and the fevers and acute diseases generally. The extra risks of miscarriages were recognised, and Hippocrates was much in advance of his time when he forbade (in the Oath) the artificial induction of abortion. He noted that when uterine hæmorrhage occurred before labour the child would very probably be dead, or at least not viable, and the same results were observed when the pregnant woman had suffered from general dropsy. There is an interesting statement in the treatise on *Airs, Waters, and Places*, to the effect that women who drink unwholesome water from marshes appear to be pregnant, but usually this is due to dropsy of the uterus; sometimes, however, pregnancy really occurs, and then the infants are large and swelled, during nursing become weak and sickly, and are very subject to hernia. In this passage is contained an indication of some knowledge of fœtal malaria. A fleshy fœtus (fœtus carnosus) is described in the Epidemics, and this may have been an example of general fœtal dropsy.

Hippocrates recognised that congenital diseases were very difficult to remove (prognostics), thus the prognosis in hereditary epilepsy was regarded as bad. The influence of heredity upon the shape of the skull was referred to in the description of the macrocephali, and some notice will be taken of the matter in the part of this work devoted to the history of Teratology. Reference will also be made in another place to the Hippocratic views concerning uterine moles.

By far the most important contributions to fœtal pathology made by the Father of Medicine were those dealing with congenital dislocations, club-foot, "weasel-arms," etc. He treated of congenital luxation of the hip in a manner almost as full as is done at the present day; he gave rules for the management of talipes

which have scarcely been improved upon, although more than 2000 years have passed away since they were enunciated; and he was acquainted with such rare conditions as congenital dislocation at the wrist, the knee, the shoulder, and the elbow. The high character of the powers of observation possessed by Hippocrates is attested by nothing more than by his acquaintance with the nature and treatment of these luxations.

I have discussed somewhat fully the views of Hippocrates and his pupils, both on account of their interest and value, and because for more than two millennia they dominated medical thought in Europe. Unfortunately many of the errors contained in these writings were carefully transmitted to posterity, whilst not a few of the really valuable discoveries were lost for a time.

Among the writers who lived about the time of Hippocrates were Democritus of Abdera (*b.* 460 B.C.) and Empedocles the Sicilian (*b.* 444 B.C.), to whom reference is made by Plutarch. Their views with regard to the origin of monstrous fœtuses will be found detailed in a later part of this work.

3. Plato (427-347 B.C.), the founder of Dogmatism, did not by his speculations add anything of value to the current opinions upon the fœtus; but Diogenes of Apollonia, one of his pupils, was of the opinion that the embryo originated from the male semen alone, and that the fœtus, if a male, was completely formed at the fifth month. Diocles of Carystus (350 B.C.), also a dogmatist, believed that the male semen was not foam, for he found it to be heavier than water.

4. Aristotle (384-321 B.C.), although not free from the superstitions of his time, added much that was of value to the knowledge of the subject of fœtal development, and so cleared the way for more accurate conceptions of ante-natal disease. By means of the incubation of eggs he discovered the *punctum saliens* and the vessels radiating from it, and thus laid the foundation of embryology and its sister science, experimental teratology. He admitted the heredity of faults of conformation; he believed that the formation of the embryo began with that of the heart, which was also the last part to die; that the fœtus was nourished through the umbilicus, and that it lay in a flexed attitude with the head upwards till near the term of labour, when it performed the *culbute;*

and he was of opinion that superfœtation, although rare, sometimes occurred. Generation was due to the admixture of the male semen, the noblest moisture of the body, with the menstrual blood, which was coagulated by the spiritual element present in the former. More than five children could neither be begotten, nor born, at the same time. He did not think that the male fœtus was developed on the right and the female on the left side of the uterus; but he repeated the statement of Hippocrates, that the sex of the embryo could be learnt from the complexion of the mother. He described the allantois and umbilical vessels. In contradiction to the Hippocratic teachings, Aristotle believed that the eighth month's child might not only live but also attain the ordinary term of life. Before the seventh month the fœtus was not viable. Twins, if of different sex, were not likely to live. Women who menstruated during pregnancy gave birth to small, weakly, and less viable infants; boys and girls also produced only small and imperfect children. The assertion was repeated that the birth of a male infant occupied less time than that of a female. In regard to heredity, the phenomenon of atavism would seem to have been observed.

These statements, along with some interesting remarks concerning the meconium, moles, and the tying and cutting of the cord, embody the teaching of Aristotle with respect to fœtal life; and from their consideration it will be evident that whilst the great founder of the school of the Peripatetics said little or nothing about fœtal diseases themselves, he, by means of his embryological studies, cleared the way for their investigation long years afterwards.

5. The three great schools of Alexandria, made up of the followers of Herophilus, of those of Erasistratus, and of the Empirics, although they had an extensive knowledge of many medical subjects, would seem to have added little or nothing to the earlier views upon fœtal life and development. Demetrius of Apamea, it is true, knew that difficult labours were sometimes caused by death, emphysema, and abnormalities of the fœtus; but beyond this, little that relates to ante-natal conditions is to be gleaned from their works.

Fœtal Diseases among the Romans.

The Roman medical authors did not do much to increase the amount of knowledge concerning the fœtus which was handed down to them from Hippocrates and Aristotle, although Celsus and Soranus carried the practice of obstetrics to a wonderfully advanced stage. Some of the early writers, such as Cicero, Horace, Lucretius, and Tacitus, took notice of deformed infants chiefly from the point of view of their value as portents of public calamities; but with this exception little was contributed to the study of fœtal disease.

Celsus (B.C. 30-A.D. 50, *circa*), whilst he wrote hardly anything regarding intra-uterine conditions, gave a very good description of the diagnosis and treatment of congenital imperforate auditory meatus, of tongue-tie, of exomphalos, and of hydrocele. Pliny (A.D. 23-79) alluded to the belief in the effect of maternal impressions upon the state of the fœtus, he had something to say with regard to "moles," and attributed very malign properties to the menstrual fluid. Athenæus of Attalia (A.D. 68, *circa*) followed Aristotle in his views concerning generation; the woman, he taught, had no semen, and her ovaries were superfluous organs, were present for the sake of symmetry, like the male breasts. Soranus of Ephesus (A.D. 98-138), the most learned of the school of the "Methodists," although he wrote with great fulness upon the management of children, and described the operation for imperforate anus, contributed nothing of value to the study of the fœtus. Galen, also, the greatest of the Eclectics, who lived between 131 and 210 A.D., although evidently acquainted with the hereditary nature of certain diseases, with the operation for the removal of supernumerary fingers, and with the occurrence of imperforate glans penis, took little notice of fœtal conditions save to endorse (as did also Soranus) the popular belief in the power of the mother's imagination upon the unborn infant, and to re-affirm the old Hippocratic views with regard to generation and the determination of sex. He was, however, well acquainted with several anatomical peculiarities in the fœtus, *e.g.*, foramen ovale and ductus arteriosus.

After the time of Galen little was added to our store of knowledge

concerning the fœtus and its diseases till the time of the Renaissance; but the medical opinions of St Augustine (354-430 A.D.) concerning development are of some little interest. He held that the tendons and vessels were formed in the second month of fœtal life, that the sex was fixed in the fourth, that the soul was formed in the sixth, the intestines in the seventh, and the nails and heart in the eighth.

From the point of view of the study of fœtal conditions the medical writings of the Romans had only an indirect value. They preserved the discoveries of the Greeks and handed them on to later times; and the works of Galen and Soranus, by drawing attention to the ailments of infants, had some influence upon the attitude of the medical profession with regard to the knowledge of the maladies of the earliest period of life. This influence was not, however, felt till after the passing away of the intellectual and social degradation of the Middle Ages.

Fœtal Diseases in the Middle Ages.

During the long period of intellectual darkness and barrenness which intervened between the times of Galen and those of the revival of learning, the science of medicine was so imbued with the prevailing ignorance and superstition of the age that it is no matter for wonder that one of its most obscure and difficult branches, that dealing with fœtal states, should have shared in a very special degree in the universal decadence. When causes of disease were looked for in the arrangement of the planets and stars, when the influence of the devil and of evil spirits (incubi and succubi) was invoked to explain the birth of monstrous infants, and when religion (such as it was) was directly opposed to scientific investigations, it was not to be expected that such subjects as development, fœtal anatomy, and fœtal physiology would interest men's intellects, or, indeed, attract even their notice. Yet in these dark ages there were here and there to be found faint and fitful gleams of light. In the East the Arabian physicians were preserving some of the best works of the Greeks and Romans for the use of future centuries, and in Europe the Universities of Salerno and Montpellier were endeavouring to keep alive the scientific spirit and its methods.

What the Middle Ages contributed to the study of fœtal conditions may be very briefly narrated. Aëtius of Amida in the sixth, and Paul of Ægina in the seventh century, in their medical compilations preserved some of the Hippocratic views upon generation and the diseases of children—not unmixed, however, with much that was superstitious and puerile. Amongst the Arabians, in the tenth, eleventh, and twelfth centuries, Rhazes, Ali Abbas, Avicenna, Albucasis, and Averroës were physicians of note, and had some ideas upon fœtal development and disease. The fœtus, according to Rhazes, was formed by the mixture of the male and female semen, and was of the male sex if the former was the more vigorous, of the female sex if it was not. The Arabians explained the universal predisposition to such diseases as smallpox and measles in a somewhat ingenious way. Since the pregnant woman does not menstruate, they said, impure materials must collect in her system and be applied to the nutrition of the fœtus; these impurities must be thrown off by the child at some time or other, and this occurs in the course of an attack of variola or of measles; therefore individuals are prone to suffer from these diseases, but to suffer only once. It is interesting to find in the writings of Albucasis the record of a case in which labour was delayed on account of the presence of fluid in the fœtal thorax and abdomen; paracentesis was performed in order to effect delivery.

In Europe the medical learning of the time centred in the schools of Salerno and Montpellier. Belonging to the former university were certain female physicians, amongst whom was one, Trotula de Ruggieri, who described a quaint method for determining the sex of the fœtus in utero, and another, called Rebecca Guarna, who wrote a work entitled *De Embryone*. Prominent amongst the pupils of the school of Montpellier were Bernard Gordon, author of the *Lilium Medicinæ;* Gilbert, writer of the *Laurea Anglicana;* and Gaddesden, whose work was entitled *Rosa Anglica*. These writers, the first of whom was a Scotchman by descent, and the other two Englishmen, had not much to say with regard to the fœtus; but Gordon, from his statement that smallpox and measles were due to conception taking place during menstruation, showed that he shared with the Arabians a belief in the fœtal origin of these maladies.

The remaining writers of the Middle Ages may be very briefly dismissed. Albertus Magnus (died 1280 A.D.), Vincent de Beauvais (died 1264 A.D.), and Thomas Aquinas (died 1274 A.D.), held views upon the origin of deformed fœtuses which were quite in keeping with the times. Dinus a Garbo (died 1327 A.D.) busied himself with inquiries into the nature of the semen; and Jacob of Forli (died 1415 A.D.) thought that infants were not viable at the eighth month, for at that time Saturn ruled in the uterus, and this was prejudicial to the child!

It is worthy of note that just before the close of the Dark Ages appeared the two first separate works on *Diseases of Children,* one by Magelardo of Fiume in 1472, and the other by Metlinger in 1473.

CHAPTER V.

HISTORICAL SKETCH OF THE DISEASES OF THE FŒTUS—Continued.

IN THE SIXTEENTH CENTURY; IN THE SEVENTEENTH CENTURY.

Fœtal Diseases in the Sixteenth Century.

In the end of the fifteenth and beginning of the sixteenth centuries great events occurred which stimulated life and thought in Europe, and had a far-reaching influence upon the progress of medical science. These events were the invention of printing, the discovery of America, the Reformation in religion, and the Revival of Art and Literature. Occurrences of scarcely less importance were the invention of firearms, of clocks, and of the compass, the astronomical discoveries of Copernicus, and the foundation of many noted universities in Germany, Italy, and Scotland. The study of the old authors (Humanism) was recommenced, and everything tended to encourage the investigation of the natural sciences and of medicine. The sixteenth century, says Baas,* was "the golden age of the great anatomists, of Vesalius, Falloppio, Eustachi, and all the others, who, partly by the genuine excellence of their work, partly, too, by the newness and consequent fertility of their field of labour, became immortal in the department of anatomy." When, therefore, we come to inquire into the progress in the study of fœtal conditions which was accomplished in this century, it is with no surprise that we find chronicled many important advances in the knowledge of fœtal anatomy.

* *History of Medicine*, p. 360.

The anatomical discoveries of the sixteenth century had a very marked influence upon the progress of the knowledge of fœtal diseases, although the effects of this influence were not immediately evident. A short notice of the writers who devoted themselves in whole or part to the study of the anatomy of the fœtus may here be given. Gabriel de Zerbis (1468-1505), in his work on the anatomy of the human body, made some investigations into that of the embryo; but his work paled into insignificance before that of Falloppio of Modena (1523-1562), who discovered the foramen ovale, described the development of the teeth, noted the absence in the fœtus of the petrosal and sphenoidal air sinuses, and demonstrated that the fœtal sternum was made up of seven separate bones, and the lower jaw of two. Several of his discoveries had been known to Galen. Vesalius also (1514-1564) added to our knowledge of ossification and described the ductus venosus. Botallo (*b.* 1530) has had his name associated with the ductus arteriosus; but he was not the first to describe that structure, for it had been known to Galen. It is a striking fact that Fabricius ab Aquapendente (1537-1619) was aware of the existence of mucus in the tympanic cavity of the infant at the time of birth. Eustachi (*d.* 1574) did much to advance the knowledge of adult and fœtal anatomy, and gave drawings of a human fœtus; and Fernel (1485-1558) gave a correct account of the method in which the testicles reached the scrotum. Aranzio (1530-1589), in his work *De Humano Fœtu*,* gathered together for the first time in a separate book what was known of fœtal anatomy and physiology and of generation. The work is composed of fourteen chapters: of these the first three deal with the anatomy of the uterus; the fourth is concerned with the menstrual blood, and the fifth with the semen; the sixth is entitled "De generatione et usu uterini jecoris;" the seventh, eighth, and ninth describe the umbilical vessels; the tenth contains the description of the fœtal membranes; the eleventh treats of the urachus, and the twelfth of the position of the fœtus in utero; and the remaining two chapters are

* *Julii Cæsaris Arantii Bononiensis de Humano Fœtu Liber.* Venetiis, Apud Barthol. Carampellum, 1595.

"De excrementis fœtus utero contenti" and "De vasorum cordis et jecoris conjunctione." *

Other writers who dealt with the anatomy of the fœtus were Koyter (1534-1600), who wrote on its osteology and the development of the bones; Adrian van den Spieghel (1578-1625), who was the author of a work *De Formato Fœtu;* and Aldrovandi (1522-1605), although better known as the author of a large work on monsters, wrote also on the development of the fœtus. Severin Pineau (*d.* 1619) in his work (*Opusculum Anatomicum*, 1597) discussed the ossification of the fœtal skeleton.

Whilst in the sixteenth century the additional knowledge acquired with regard to the fœtus was chiefly anatomical, it was not entirely so. Certain discoveries in fœtal physiology followed those in anatomy. Servetus (1509-1553) and Colombo † (1490 ?-1559), by their discoveries concerning the pulmonary circulation, threw some light upon the course of the fœtal blood, and the latter also protested against the old theory of the "culbute."

Embryology can hardly be said yet to have existed, but Fabricius ab Aquapendente broke new ground in this direction, for he was the first to discover the cicatricula in the hen's egg; he was,

* Julii Cæsaris Arantii Bononiensis
De Humano Fœtu Liber.
Venetiis, Apud Barthol. Carampellum, 1595.

† *De re Anatomica.* Venet., 1559.

however, in error when he regarded it as of the nature of a cicatrix.

Among those who in this century wrote upon midwifery there were several who described cases of fœtal disease. These were Rhodion (*d.* 1526), Rueff (*d.* 1558), Louise Bourgeois (*b.* 1564), Guillemeau (1550-1613), and others. Bourgeois described a case of twins in which one suffered from general dropsy. Fernelius (1497-1558) wrote upon malaria and variola in the new-born, Fabricius de Hildan (1560-1634) discussed variola in the fœtus, and Balduin Rusaeus described a case of congenital hydrocephalus in which the fœtus was removed by Cæsarean section (1562).

There were several authors* who in the sixteenth century wrote upon monsters and discussed incidentally some of the diseases of the fœtus; but, as will be seen in another part of this work, teratology was at this time so much under the influence of superstitious views that only a very few of the observations chronicled could be relied upon.

We cannot leave this epoch without recording that in it lived Theophrastus von Hohenheim—Paracelsus—a man who did much to advance the practice of medicine, although he unfortunately clothed his really great ideas in the words of a magician and mystic. His views concerning the fœtus and embryo were interesting, and in many points in advance of the age in which he lived.

Whilst many were the advances in medicine that were made in the sixteenth century, there was nevertheless a dark side to the picture, for it was essentially the age of the belief in witchcraft, with all its attendant horrors and persecutions and cruelties. As might be expected, the views of the day concerning fœtal states were tinged with the prevailing superstitious ideas, and deformed fœtuses, and, it is probable, diseased fœtuses also, were looked upon as of supernatural and demoniacal origin.

* Vergil, Camerarius (1552), Lycosthenes (1557), Fincelius (1567), Varchi (1560), Wierus (1563), Marconville (1563), Sorbinus (1570), Paré (1573), Lemnius (1581), Irenæus (1585), Weinrichius (1595), Horstius (1595), Boiastuau (1597-8), Osten (1600), Aldrovandi (1605), and Schenkius (1609).

Fœtal Diseases in the Seventeenth Century.

Whilst in the sixteenth century the chief advance in the study of the fœtus was made in the investigation of its naked-eye anatomy, in the seventeenth century discoveries relating to its structure as revealed by the microscope and to its physiology were prominent in the field of research. *Pari passu* with this better understanding of embryonic existence and of fœtal physiology came an increase in the number of ante-natal diseases described, and a greater accuracy and fulness in the records of such maladies. Still the full effects of these embryological and physiological advances were not witnessed immediately, and in this century no separate work appeared dealing with the diseases of the fœtus.

The authors who in the seventeenth century incidentally wrote upon fœtal maladies, and their contributions to this subject, may now be enumerated; and thereafter some notice will be taken of the embryological and physiological works of Harvey, Malpighi, de Graaf, and others.

The notices of fœtal diseases were chiefly to be found in the works of obstetricians, and the increase in the number of such notices was probably due, in part at any rate, to the two facts that in this century midwifery was rapidly passing into the hands of men, and that these men were trained surgeons. Jacques Guillemeau (1550-1613), for instance, in his work on obstetrics (1621), described cases of fœtal ascites, hydrocephalus, etc.; Portal (*d.* 1703) noted a case of distension of the bladder with ascites in the fœtus (1671); Philippe Peu (*d.* 1707) wrote upon fœtal hydrothorax and ascites (*Pratique des Accouch.*, 1694); and Guillaume Mauquest de la Motte (1655-1737) described cases of labour complicated by general dropsy, by ascites, and by inflammatory peritoneal effusion in the fœtus. These were the cases of fœtal disease most likely to attract the notice of obstetricians, for they rendered difficult the confinement with which they were associated. But of all the writers on midwifery, François Mauriceau (*d.* 1719) was the one who, in this century, made the most valuable observations on morbid states of the fœtus. He himself was the subject of a fœtal disease; for his mother, whilst carrying him in her womb, was engaged in nursing his brother, who died of smallpox,

and although she did not contract the affection, Mauriceau was born covered with variola pustules. He described cases of fœtal ascites, variola, and syphilis; was a believer in the potency of maternal impressions received before the third month of pregnancy; recognised placental disease as a cause of fœtal death; and noted that although the mother suffered from phthisis and other serious diseases during her pregnancy, the infant might be born alive and healthy.

Other medical authors who described fœtal diseases were:—Johann Rhodius, a Dane (1587-1659), who noted fœtal syphilis and the presence of teeth in the infant at birth; Francis Glisson (1597-1677), who first observed rickets and noted its occurrence in the fœtus; Thomas Bartholin (1616-1680), who wrote on variola and hypertrophy of fœtus, and described absence of the skin at birth; Stalpart van der Wiel (1620-1687), on nævus maternus and fœtal variola; Theodor Kerkring (1640-1693), on fœtal jaundice and intestinal worms; and Georg Wolfgang Wedel (1645-1721), on ante-natal syphilis.

Besides these there were several authors who contributed cases of fœtal maladies to the numerous Decuriæ of the *Miscellanea Curiosa Medico-physica Academiæ Naturæ Curiosorum** (1670-1702), and to the *Acta Medica et Philosophica Hafniensia*† of Thomas Bartholin (1671-1679).

There were many writers who in this century produced large treatises upon fœtal monstrosities, in which the diseases properly so-called were sometimes touched upon; but to these authors allusion will be made in a later volume of this work.‡

* Möllenbroccius, Ledelius, Sommer, and Gruebel wrote on fœtal variola; Ledelius and Roesler on measles; Francus on scrofula; Crausius, Ludovicus, and Göckel on teeth at birth; Göckel also wrote on pemphigus, and Becker on syphilis; Stegmann and Schroeter on worms in the fœtus; Seeger on epilepsy and general dropsy; Dorstenius on general dropsy; Geyer on stone in the bladder at birth; and Schultz and Fehre on jaundice of the fœtus.

† Borrichius on variola and syphilis in the fœtus, and Koelpin on pus in the fœtal thorax.

‡ Amongst the writers on Teratology in this century were:—Schenkius, 1609; Riolan, 1605, etc.; Bauhin, 1614; Maierus, 1619; Licetus, 1616; Tulpius, 1641; Stengelius, 1647; Wallrich, 1655; Kalinkius, 1657; Eichstadius, 1658; Pihringer, 1664; Stricerius, 1665; Viardel, 1671; Schmuck,

Whilst there were thus not a few direct contributions to the subject of fœtal diseases in this century, these were of comparatively small value when contrasted with the advances in human physiology and in embryology which served indirectly but powerfully to elucidate the problems of ante-natal pathology. The great discovery of the circulation of the blood by Harvey (1578-1657) has always been recognised as having put animal physiology on a sound foundation; but the investigations which he made upon generation * did almost as much for the subject of embryology. By these studies he proved that viviparous as well as oviparous animals produced ova, although from his ignorance of the real nature of the ovaries he erred in considering that these were formed in the interior of the uterus. The full value of Harvey's work was made manifest only when Stenon (1667) found ova in the Fallopian tube of the shark, and when he as well as de Graaf found vesicles in the human ovary which were regarded as the long looked-for ova. It is true that the vesicles were not themselves the ova, but they contained them (as was shown by Baer † in 1827), and the value of the discovery remained practically undiminished. It may be noted here that Caspar Bartholin, ‡ by his investigations on the glands that bear his name, had done much to settle for ever the question of the female semen, and had so cleared the way for the work of Stenon and de Graaf. It was just at this stage in the history of embryology that the theory of the "pre-existence of germs" with all its attendant complications and difficulties saw the light. Swammerdam (1637-1686) was the first to press this theory upon the notice of the scientific world; but it would seem that Aromatari had as early as 1625 formulated his belief in it as it affected the vegetable kingdom, and had thought that it might also apply to the chick in the hen's egg. Through observations upon the metamorphosis of insects and upon the structure of the human ovaries, Swammerdam came to

1679; T. Bartholin, 1645; Mirus and Fischer, 1681; W. ten Rhyne, 1683; Kursnerus, 1684; Steigerthal, 1686; Valentini, 1688; D. van der Sterre, 1687; Ruysch, 1691; Grætz, 1694; and Bunzelius, 1698.

* Harvey, *Exercitationes de generatione animalium.* London, 1651.

† Baer, C. E. v., *De ovi mammalium et hominis genesi.* Leipzig, 1827.

‡ Bartholin, *Anatomia Reformata*, 1651.

regard the theory of the pre-existence of germs as a law universally applicable in the animal kingdom, and finally as a religious dogma which satisfactorily explained original sin. The idea that the embryo was preformed in the ovum before impregnation, and that thereafter the only change that occurred was increase in size of its parts, was also held by Malpighi* and by Malebranche† (1672). The effect of the doctrine of the pre-existence of germs as enunciated by the above-named theorists was to check progress in the subject of embryology for many years, and so to interfere also with the acquisition of correct notions concerning fœtal pathology. These consequences will be traced in the history of ante-natal disease in the eighteenth century. Discoveries were also made at this epoch bearing upon the male element in generation, for Ludwig von Hammen (1652-1689) made known the existence of spermatozoa or animalcules, and Leeuwenhœck found them in the uterus in one of the lower animals, and ascribed to them a preponderating importance in embryological processes. From the researches of Harvey and Leeuwenhœck arose the two contending parties, the Ovists and the Animalculists.

The writers of the seventeenth century also helped to advance the study of intra-uterine pathology by their researches on the anatomy and physiology of the fœtus and its annexa. Walter Needham published in 1667 his *Disquisitio Anatomica de Formato Fœtu*, in which he described the umbilical vesicle, the fœtal and maternal parts of the placenta, and the changes in the gravid uterus in the human subject and in some of the lower animals; he also recognised that the nutrition of the fœtus was carried on by blood from the placenta passing through the umbilical cord. His book consisted of seven chapters and 205 pages, and appeared in London. Mayo (1645-1679) ascribed to the placenta a respiratory function. Nymmanus also published a work entitled *Dissertatio de vita Fœtus in Utero*, and Drelincourt (1633-1697) showed that an eight months' fœtus was viable. Nicolaus Hoboken (1632-1678), in a book of 548 pages,‡ gave a very complete account of the fœtal annexa (placenta, membranes, and umbilical

* Malpighi, *De formatione pulli in ovo*, 1672.

† Malebranche, *Recherche de la vérité*, 1672.

‡ *Anatomia Secundinæ Humanæ*, 1675.

cord), and illustrated his descriptions by some good drawings. Thomas Wharton (1610-1673) described the mucoid tissue in the umbilical cord, which is to this day known as the "jelly of Wharton." Kerkring (*Spicelegium Anatomicum*, 1670), Ruysch (*Observationum Anatomico-chirurgicarum Centuria*, 1691), and especially Lamzwerde (*Historia Naturalis Molarum Uteri*, 1686), did much to remove the old errors and prejudices which had gathered round the subject of early fœtal diseases and the nature of uterine moles. The floating of the lungs as a test for the settlement of the question of infanticide was used by Schreyer in 1681.

This century also produced writers on the Diseases of Infancy, amongst whom may be mentioned Walter Harris (*De Morbis Acutis Infantum*, 1689), who at the advice of Sydenham published his experience in treating children's diseases, and Ettmüller, the author of *Valetudinarium Infantile* (1675).

It may be gathered, therefore, that in the seventeenth century investigations were proceeding along different lines, which brought about the adoption of more correct views upon the diseases of the fœtus, stimulated investigators in the next century to consider more fully this branch of study, and led to the appearance of works specially devoted to ante-natal maladies.

CHAPTER VI.

HISTORICAL SKETCH OF THE DISEASES OF THE FŒTUS—Continued.

IN THE EIGHTEENTH CENTURY; SEPARATE WORKS BY DUTTEL, VALENTIN, SCHURIG, NOLDE, OEHME, ZIERHOLD, HOOGEVEEN, ENGELHART; REFERENCES TO DISEASES OF THE FŒTUS IN TEXT-BOOKS ON DISEASES OF CHILDREN, MIDWIFERY, PATHOLOGY, AND TERATOLOGY.

Fœtal Diseases in the Eighteenth Century.

In tracing the history of the progress of the study of fœtal diseases in the eighteenth century it will be well, first, to describe the works specially devoted to this branch of medicine; second, to refer to reports of cases scattered throughout the literature of the time; and third, to take some notice of advances in other subjects of medical study which had an important bearing upon the elucidation of the nature of ante-natal disease.

In 1702 * appeared the first work upon fœtal diseases properly so-called: this was the dissertation of Philippus Jacobus Düttel, *De Morbis Fœtuum in Utero Materno.* It is probable that most of the facts recorded in this treatise were supplied by Hoffmann; at any rate the dissertation is found incorporated in editions of his complete works without any allusion being made to Düttel. The paper extended to thirty-one chapters and occupied thirty-two pages. It embraced the consideration of fœtal smallpox, measles, syphilis, jaundice, malaria, general dropsy, hydrocephalus, epilepsy, stone in the bladder, and umbilical hernia. Cases of the above-named diseases from various sources were grouped together and compared, and some new observations were added. A great deal was said concerning the maternal causes of fœtal diseases, for Düttel was a firm believer in the existence of a close affinity

* The date upon my copy is MDCII., but this is evidently a misprint.

between the state of the mother and that of the fœtus in utero, and endeavoured in every case to demonstrate this sympathy. He regarded all ante-natal diseases as due to a maternal cause, and his treatment of such conditions consisted in the bleeding of the mother, and the administration to her of various medicines, such as rhubarb, antispasmodics, and carminatives. It is needless to say he had great faith in the potency of maternal impressions.

In one part of his work Düttel said, "Spe innixus firmissima, fore, ut opus hoc, et labor, non sine utilitate, atque emolumento proximi cedere possit," and it was not long before his wish was realized, for in 1704 appeared a treatise of the same kind by M. B. Valentin. It was entitled *Praxis Medicinæ Infallibilis, cujus Disputationem I., de Morbis Embryonum, cum Annexa Dispensatorio Domestico, Gissæ Hassorum.* Grætzer was unable to find a copy of this work, and I regret to say that I have been likewise unsuccessful.

D. M. Schurig was the next writer who collected together, often with little judgment as Grætzer says, the recorded cases of fœtal disease. In his large work, entitled *Embryologia Historico-medica*, etc., Dresdæ et Lipsiæ, 1732, he made many references to ante-natal pathology. The first chapter of the third * section of his book had the heading "De Embryonum Morbis," and consisted of 22 paragraphs dealing with such fœtal conditions as epilepsy, muscular contractions, smallpox, measles, malaria, syphilis, wounds, jaundice, the fœtus niger, excoriations, dropsy, hydrocephalus, singultus, hernia, premature dentition, stigmata, rigidity, and death. The second chapter of the same section gave an account of the pathological states due to fœtal death, such as putrefaction, maceration, and petrification; and elsewhere in the work were interesting references to the causes of abortion, to hydatid moles, and to still-birth. The cases were mainly drawn from the *Miscellanea Curiosa Medico-physica*, from the *Acta Hafniensia*, and from the writings of Bartholin, Fernel, Stalpart van der Wiel, Schenkius, Ettmüller, Wedelius, and others; but some were original.

In 1768 J. A. Nolde published an inaugural dissertation,

* Grætzer gives the reference as the *fourth* section, and it is thus printed in my copy also; but the text shows this to be a mistake, it is the *third* section.

entitled *De Parentum Morbis in Fœtum Transientibus.* In this the author divided fœtal maladies into five classes, according as they had their origin in the father, in the mother, in the fœtus itself, in a mole growing with it in the uterus, or in external injuries. This thesis, although not noted by Grætzer, marked a distinct advance in the appreciation of the character of ante-natal diseases.

Oehme in his dissertation, *De Morbis Recens Natorum Chirurgicis,* Lipsiæ, 1773, gave a very accurate account of the surgical diseases found in the infant at the time of birth, amongst which were placed those due to intra-uterine disease. He described umbilical, inguinal, and scrotal hernias, a case of bronchocele, etc. I have not been able to refer to the original dissertation, but Grætzer considered it to be one of the best of the time, and useful even in his day.

Soon after the appearance of Oehme's work Zierhold published his dissertation, entitled *De Notabilibus quibusdam quæ Fœtui in Utero contingere possunt,* Halæ, 1778; and Theodore Hoogeveen brought out his large *Tractatus de Fœtus Humani Morbis,* Lugduni Batavorum, 1784. The latter work consisted of seven chapters, and extended to 148 pages.* The first three chapters treated of matters relating to fœtal anatomy and physiology; the fourth chapter contained an account of such intra-uterine diseases as variola, measles, pleurisy, malaria, jaundice, stone in the bladder, wounds, nævi, etc., and dealt very largely with the causes of such ailments, amongst which the maternal imagination played a great part; and the fifth, sixth, and seventh chapters were devoted to diagnosis, prognosis, and treatment. The work, although large, was a comparatively unimportant addition to the accumulating store of books treating of fœtal maladies.

In 1792 appeared a dissertation by Engelhart, entitled *Sistens Morbos Hominum a Prima Conformatione usquead Partum.* This was presented for graduation at Jena, under the presidentship of Gruner, and in it were embodied the views of Gruner upon the nature of maternal nævi.† The potency of the mother's imagination in the production of such marks was denied, and they were

* My copy has, in addition, a fasciculus of anatomical observations (21 pages), including the account of one or two autopsies on new-born infants.

† Gruner, *De Nævorum Originibus,* Jenæ, 1778.

regarded as due solely to fœtal morbid processes, congestion, blood extravasation, etc. In this dissertation not only fœtal diseases were treated of, but there were also chapters devoted to generation, monstrosities, and molar pregnancies.

Such were the works, all written in Latin, which in the eighteenth century were devoted entirely to the subject of ante-natal diseases; but in the text-books dealing with Diseases of Children and Obstetrics there were also found scattered references to these maladies. Thus Nicholas Rosen von Rosenstein (1706-1773), in his treatise *De Morbis Infantum* (1752),* spoke of fœtal variola, rickets, measles, jaundice, etc.; and he made the following very interesting statement about syphilis: "When the poison at the time of conception lies dormant, either naturally or by some remedies which the parents have used, and by which it has not been quite extirpated but only weakened, the children will scarce ever get any venereal disease. The contagion has then undergone a change, and causes the rickets, or scrophulæ, or other distempers, that we hardly would expect to arise from such a cause. Such children grow tender and weak, as also their offspring, from generation to generation." M. Raulin, in his *Traité des Maladies des Enfans*, Paris, 1768, considered very fully the diseases of the fœtus, and made some notable advances with regard to their nature and origin. He divided all such diseases into two groups. In the first he placed those that were due to a maternal cause, such as syphilis, malaria, variola, measles, convulsions, and jaundice; and in the second those peculiar to the fœtus itself, among which he named diseases of the skin, head and abdomen, and atrophy, dropsy, variola, convulsions, and jaundice, when these occurred in infants with healthy mothers. He also gave no credence to the belief in the potency of the maternal imagination in the production of fœtal morbid states, and thus allied himself with the followers of Blondel. J. A. Blondel had in 1727 published in London his well-known treatise on *The Strength of the Imagination in Pregnant Women*, and he had been followed by many other writers who joined with him in condemning the belief, and relegating it to the category of old wives' tales. M. Underwood (1715-1795),

* English Translation, by A. Sparrman, London, 1776.

also, in his *Treatise on the Diseases of Children*, 1784, spoke of many congenital maladies, such as pemphigus, worms, encephalocele, hydrocele, hydrocephalus, nævi materni, etc.; but his most important contribution was his description of the "skin-bound disease," which he rightly regarded as sometimes congenital. This last-named malady is now known as sclerema neonatorum, but Underwood's description of it has scarcely yet been improved upon. He was not a believer in the maternal imagination as a factor in the production of fœtal diseases. C. Girtanner (1760-1800) was another writer who, in his work entitled *Abhandlung über die Krankheiten der Kinder*, Berlin, 1794, spoke of such fœtal maladies as congenital rose, hydrocele, exomphalos, hardening of the cellular tissue, venereal disease, smallpox, measles, etc. He did not think that rickets was ever congenital, and held the same opinion with regard to scrofula. Storch, however, in his work on Children's Diseases (Eisenach, 1750) had described congenital rickets. F. Jahn (1766-1813), in his *System der Kinderkrankheiten*, 1807, also touched upon certain fœtal maladies.

Amongst the obstetricians of the century, Smellie, Röderer, Levret, and others recorded cases of fœtal disease. Thus W. Smellie (1680-1763), in his *Treatise on the Theory and Practice of Midwifery*, 1752, noted cases of fœtal smallpox and hydrocephalus; J. G. Röderer (1726-1763) wrote a disputation, *De Vi Imaginationis in Fœtum negata*, in 1756; P. Amand (died 1720) described a case of intra-uterine fractures in 1714; A. Levret (1703-1780) recorded a case of fœtal ascites; and J. Galetti (1778) noted a specimen of fœtal hydrothorax and ascites.

There appeared some few separate papers dealing with one or other of the fœtal diseases. Thus J. C. Gehler (1732-1796) wrote one entitled "De Partu difficili ex Hydrope Fœtus," Lipsiæ, 1762; J. A. Socin had another on the same subject, "De Fœtu Hydropico," 1751; Jesaius Juda described a case of umbilical hernia in his dissertation *De Fœtu Observationibus*, Göttingæ (1758); Jermyn produced a dissertation, *De Variolis a Gravida Fœtui Traditis*, Lugd. Batav., 1792; and J. H. Klein had a *Dissert. Inauguralis Medica, Sistens: Casum Rhachitidis Congenitæ Observatæ*, Argentor, 1763. Further, isolated cases of fœtal disease were noted in the *Philosophical Transactions of London* (Watson and Wright on

smallpox); in the *Academiæ Cæsareo-Leopoldinæ Naturæ Curiosorum Ephemerides*, Francofurt, 1712-1722; in the *Acta Physico-medica Academiæ*, etc., Norimbergæ, 1727-1754; in the *Nova Acta*, 1754-1791; in the *Acta Regiæ Societatis Medicæ Havniensis*, 1791; and elsewhere.

Writers in other branches of medical study did much in this epoch to favour the advance of the subject of fœtal pathology. G. B. Bianchi (1681-1761), in his work entitled *De Naturali in Humano Corpore Vitiosa, Morbosaque Generatione Historia*, Torino, 1741, advanced the hypothesis that many forms of monstrosity were due to antecedent fœtal diseases; and the famous G. B. Morgagni (1682-1772), in his book *De Sedibus et Causis Morborum*, Venice, 1761, pointed to a probable connexion between early intra-uterine hydrocephalus and anencephaly. These opinions were destined to be widely adopted and greatly expanded in the nineteenth century.

Embryology and teratology were subjects in which much progress was made in the last century. From 1700 to 1750 the doctrine of the pre-existence of germs somewhat hindered the rate of advance in both; for many investigators spent much time in long discussions, of a semi-religious nature, bearing upon this theory, and upon the closely allied one of the pre-existence of monstrous germs. Amongst these writers Duverney (1648-1730) and Winslow (1669-1760) were prominent supporters of the doctrine, whilst Lemery (*d.* 1743) denied the possibility of original malformation in the embryo. The reports of this controversy, which lasted for nearly forty years, appeared in the *Mémoires de l'Academie des Sciences* of Paris. Towards the middle of the century two epoch-making writers appeared—the Russian Caspar Friedrich Wolff (1735-1794), and the German Albert von Haller (1708-1777). Both did much for the study of embryology,—Wolff by his doctrine of epigenesis and researches on the organs in the fœtus which bear his name, and Haller by his descriptions of the development of the chick, and by his laborious compilation upon the subject of monstrosities. There were others also who threw light upon fœtal anatomy and embryology, amongst whom may be specially mentioned C. J. Trew (1695-1769), B. S. Albinus (1697-1770), William Hunter (1718-

1783), Wachendorf (1737), Spallanzani (1729-1799), H. A. Wrisberg (1739-1808), Vicq d'Azyr (1748-1794), J. F. Blumenbach (1752-1840), S. T. von Sömmering (1755-1830), and J. H. F. Autenreith (1772-1835). Writers upon fœtal monstrosities were very numerous in this century, and although their works will be specially noted elsewhere, the names of the more important may be mentioned here. They were:—Posner (1702), Crausius (1705), Palfyn (1708), Nigrisoli (1712), Gimma (1714), Martinus (1738), Busson (1743), Bellet (1745), Huber (1748), Tyson (1751), Boerhaave (1754), Madai (1763), Van Doeveren (1765), Zimmermann (1765), Leontowytsch (1766), Insfeldt (1772), Regnault (1775), Bosch (1780), Pütter (1784), Torkos (1787), Blumenbach (1789), Jacobi (1791), Klein (1793), Metzger (1793), and Ottens (1799), besides Haller, Wolff, and others that have already been named.

To summarize, the investigation of fœtal diseases made many advances in the eighteenth century. More enlightened views, due to progress in allied subjects, began to prevail in this department of Medicine; special treatises began to appear dealing solely with ante-natal disease; the belief in maternal agencies as the only causes of fœtal maladies was much weakened; and several hitherto undescribed morbid congenital states were recognised and investigated. All this was quite in keeping with the spirit of the age, which was philosophical and critical, had thrown off many of the trammels of the past, and was pushing forward along the road of scientific experiment towards the triumphs of medical diagnosis and treatment in the future.

CHAPTER VII.

HISTORICAL SKETCH OF THE DISEASES OF THE FŒTUS—Continued.

IN THE NINETEENTH CENTURY; SEPARATE WORKS BY CHAUSSIER, OEHLER, MURAT, SEELIGMANN, ZUCCARINI, HUFELAND, HARDEGG, BERGK, ANDRY, ZURMEYER, DUGÉS, OLLIVIER, HÜTER, BERGMANN, GRAETZER, MONTGOMERY, SIMPSON, ROBERTS, DESORMEAUX, FABRE, AMMON, GROSSE, ROBERT, BEZETH, CANDIANI, STEPHAN, HOHL, GUEZENEC, MADGE, COPLAND, RAABE, DROUADAINE, BAILLY, PINARD, AND KLEINWÄCHTER; REFERENCES IN TEXT-BOOKS ON PEDIATRICS, OBSTETRICS, PATHOLOGY, MEDICAL JURISPRUDENCE, TERATOLOGY, AND VETERINARY PATHOLOGY AND OBSTETRICS.

Fœtal Diseases in the Nineteenth Century.

In the nineteenth century a comparatively large number of separate works has appeared, dealing in a systematic manner with the diseases of the fœtus, and a very large quantity of material bearing upon one or other of these maladies has been accumulated in the form of graduation theses and the like. But writers on other subjects of medical study have also made important contributions to the subject of ante-natal pathology; for in many of the works on Pediatrics, on Midwifery, on Medical Jurisprudence, on Morbid Anatomy, and on Teratology are to be found more or less extensive references to it. These last-named writers approached the subject for the reason that it had a direct relation to the diseases of childhood, or to the progress of labour, or to the problems of the law-courts, or to general pathological processes, or to the production of monstrosities; but their contributions are not less valuable on that account, their importance is indeed rather enhanced. The appearance of notes upon fœtal disease in such widely separated departments of medical practice and study has demonstrated its close connexion with and noteworthy bearing upon them all.

It will be necessary now to pass in review the special works

treating of all or of several of the diseases of the fœtus which have been published in the present century.

F. Chaussier (1746-1828) was the first to make any noteworthy additions to the subject, and he published at intervals a series of papers * containing an account of the various maladies of the fœtus which he met with at the Paris Maternity Hospital. Many of his conclusions were embodied in an article on monstrosities written by Adelon and himself, which appeared in the *Dictionnaire des Sciences Médicales*, vol. xxxiv., Paris, 1819. His most important contributions were those upon cases of peritonitis and enteritis, of miliary tubercles in the lungs, of multiple dislocations, of fractures, and of rickets; these were deservedly much quoted by subsequent writers.

In 1815 there was published at Leipzig F. E. Oehler's inaugural dissertation entitled *Prolegomena in Embryonis Humani Pathologiam*. Oehler won great praise from Graetzer, who regarded him as "indisputably the first who has given systematic foundation to a pathology of the fœtus, which possesses at the same time the merit of being a careful scientific work." His thesis, which extended to 48 pages, had on its title page the fitting maxim from Horace, "Vitiis nemo sine nascitur," and was divided into two parts, the first of which dealt with fœtal physiology and the second with fœtal pathology. There were also some introductory paragraphs in which Oehler pointed out that each of the different periods of life had to some extent diseases peculiar to it; and that as the physiology of the fœtal existence was in many points unlike that of the extra-uterine state, so it would be found that the maladies of the embryo differed from those of the adult. Pathological influences might affect the ova while still in the ovary, through disease of the latter organ, or the embryo might be morbidly acted upon by changes in the quality or quantity of the nourishment passing to it from the mother through the placenta, or by alterations in the maternal temperature. The etiological importance of the father was not overlooked. Oehler then described abnormal

* *Discours prononcé à l'hospice de la Maternité*, Juin 1810 et 1812; *Procès verbal de la distribution des prix aux elèves sages femmes de l'hospice de la Maternité*, 1812; *Bulletins de la Faculté de la Société de Médecine*, Paris, 1813 et 1821.

conditions of the placenta, membranes, umbilical cord, and liquor amnii, and thereafter passed to the consideration of the deformities and diseases of the fœtus itself. Of the latter he specially referred to four morbid conditions: (1) a swelling and hardness of the mesenteric glands; (2) a peculiar vesicular eruption like pemphigus; (3) a deposition of concretions in some of the larger blood-vessels; and (4) a dilated state of the ureters, with thickening of the bladder-walls. The dissertation was much marred by the fact that no reference was made to the diseases of the fœtus which had been described by other writers, still it contained much that was of value, and was often referred to by later authors.

Murat, in his article on the Fœtus (*Dictionnaire des Sciences Médicales*, tom. xvi. p. 49, Paris, 1816), gave a short account of certain of the diseases of intra-uterine life. His conclusions were based nearly entirely upon the researches of Chaussier, and related to such conditions as fœtal fractures and dislocations, rickets, spontaneous amputation of parts as shown by the existence of cicatrices, congenital tumours, fœtal skin affections, including smallpox, and intra-uterine nervous diseases. He also noted the occurrence of effusions into the pleuræ, pericardium, and abdomen; of miliary tubercles and abscesses in the lungs; of aneurismal dilatation of the heart, and of ecchymoses on its surface; of stone in the kidney, and of dilatation of the ureters; and of effects produced on the fœtus by maternal hæmorrhages, etc. Amongst the causes of disease which he mentioned were bad health of the mother; long continued abdominal pressure, which, by hindering the growth of the uterus and the secretion of the liquor amnii, determined the approximation, coalition, warping, or disarrangement of the different parts of the fœtus; too abundant excretions, etc. He observed that diseases which affected all the systems were those that were usually transmitted hereditarily, and named epilepsy, gout, and hypochondria; whilst those that were localized were very rarely communicated to the descendants, *e.g.*, blindness, deafness, lameness, etc.

In 1820 C. Seeligmann published at Erlangen his inaugural dissertation entitled *De Morbis Fœtus Humani*. In the first part of this thesis he considered some of the phenomena of generation and of intra-uterine physiology, and in the second the pathology

of the fœtus. After dealing with the origin of uterine moles, and with the diseases of the placenta and umbilical cord in their relation to the health of the fœtus, he went on to discuss fœtal diseases proper. Amongst these he described, first, diseases of the skeleton (rickets, fractures, and dislocations); second, maladies of the cutaneous system (exanthemata, syphilis); third, those of the lymphatics (enlargement of mesenteric glands); fourth, those of the circulatory system; fifth, those of the muscular apparatus, as club-foot; sixth, those of the nervous system, as convulsions; and seventh, the malformations of the genito-urinary system. There were added some short remarks on morbid states of the heart, lungs, intestine, and liver. The work is a useful compilation.

This dissertation was soon followed by another, that of Zuccarini, which appeared, also at Erlangen, in 1824. It was entitled *Einiges zur Beleuchtung der Krankheiten der menschlichen Frucht.* Like Seeligmann he included many malformations among the diseases; but the classification he adopted was better than any of those previously advanced, and he recognised developmental maladies. His knowledge of the literature of the subject was unfortunately somewhat restricted, and this fact diminished considerably the value of his work.

In the *Journal der practischen Heilkunde*, vol. lxiv., part 1., Berlin, 1827, C. W. Hufeland published a treatise named "Die Krankheiten der Ungebornen und die Vorsorge für das Leben und die Gesundheit des Menschen vor der Geburt." This paper was translated into several languages; thus, for example, it appeared in French in the *Journal Complémentaire du Dictionnaire des Sciences Médicales*, vol. xxviii. p. 319, Paris, 1827. Hufeland began by pointing out that for the physician the life of the fœtus before birth was a subject that ought not to be neglected. He then stated that the unborn infant was brought into connexion with the mother and the external world in the following ways:—through the blood; the nervous system; mechanical influences, such as falls and blows; general natural agencies, such as heat, electricity, and medicinal and other substances in solution; and through a kind of metastasis, as seen in cases of transmission of dropsy or syphilis from mother to fœtus. He concluded that it was possible to act upon the unborn infant in seven different ways: (1) by increase or diminution of the food-

supply; (2) by increase or diminution of the blood-flow; (3) by changes in the composition of the food or air; (4) by mechanical means, such as posture; (5) by the general natural agencies; (6) by medicinal substances passing from the mother to the fœtus; and (7) by moral influences. Hufeland then considered the various diseases of the fœtus, and divided them into twelve classes. In the first were the monstrosities; in the second, atrophy and weakness; in the third, hypertrophy; in the fourth, dyscrasiæ, such as scrofula, syphilis, and smallpox; in the fifth, nervous disorders, such as convulsions, paralysis, cretinism, congenital idiocy, deafness, etc.; in the sixth, dropsical accumulations; in the seventh, inflammatory states; in the eighth, diseases of the skin, pemphigus, boils, etc.; in the ninth, intestinal worms; in the tenth, tumours, herniæ, goitre, etc.; in the eleventh, mechanical injuries; and in the twelfth, the death of the fœtus. He then laid down rules for the treatment of these maladies and for the production of perfectly healthy infants; but these therapeutic measures were simply the hygienic and dietetic precautions which every physician recommends to the pregnant woman. Hufeland's contribution to the subject of fœtal diseases was in many ways an important one; but it was barren of references to the writings of others, and contained not a little that was visionary and unpractical.

In 1828 H. F. Hardegg's inaugural dissertation appeared. It was entitled *De Morbis Fœtus Humani.* Like most of the preceding works of the kind, it contained some notes on generation, followed by a short account of morbid conditions of the decidual membranes, chorion, placenta, umbilical cord, amnion, and liquor amnii; the remaining seven chapters were devoted to the diseases of the fœtus. Amongst the maladies described were icterus, kirronosis (recently noted by Lobstein), dropsy of various parts, scrofula, rickets, tubercle, induration of the cellular tissue, exanthemata, ulcers, abscesses, syphilis, intermittent fever, and dislocations. Many bibliographical references were given, and, taking it as a whole, it was a good and useful compilation. J. T. Bergk's dissertation, *De Morbis Fœtus Humani*, Lipsiæ, 1829, was a work of exactly the same kind, but was even richer in references to the writings of other investigators.

Notes on certain of the diseases of the fœtus by V. Andry

appeared in the form of a "Mémoire sur les maladies du fœtus et de ses annexes" in the second series of the *Journal des Progrès des Sciences Méd.*, vol. i. (N.S.) p. 126, 1830.

In 1832 appeared at Bonn a dissertation by E. Zurmeyer entitled *De Morbis Fœtus.* In this work the author, after having said a few words with regard to monstrosities and their causes as recently set forth by Saint-Hilaire and Bernoulli, went on to describe fœtal diseases proper in six chapters. In the third chapter he devoted much space to the consideration of the inflammations, naming fœtal meningitis, pneumonia, pleurisy, pericarditis, œsophagitis, enteritis, nephritis, and peritonitis. Most of the illustrative cases were drawn from the writings of Billard, Orfila, and Dugés. In the fourth chapter, measles, smallpox, congenital pemphigus, and syphilis were described; in the fifth, the cachexiæ, such as kirronosis, icterus, dropsy, scirrhus, and tubercle; and in the sixth, the organic maladies, including hernias, dislocations, cardiac anomalies, and fractures. The dissertation was of value chiefly as a compilation from the more recent French writers.

An article on the Fœtus, written by Antoine Dugés (1798-1838), the nephew of Madame Boivin, appeared in 1832 in the *Dictionnaire de Méd. et de Chirurg. Pratique*, vol. xviii., and this same author had two years previously described many of the diseases of intra-uterine life in his *Manuel d'Obstétrique*, pp. 357-440.

P. Ollivier published a number of articles on fœtal diseases in the *Archives Générales de Médecine*—one on dropsy of the large omentum in the *first series*, vol. viii. p. 383; another on inflammation of the membranes without disease of the fœtus in the *second series*, vol. iv. p. 683; and the third and most important, entitled "Note sur quelques faits relatifs à la pathologie du fœtus," also in the *second series*, vol. v. p. 70, 1834. In the last-mentioned paper Ollivier pointed out that in many instances disease occurred in the fœtus independently of any change in the membranes, and *vice versa*, and then went on to narrate three interesting cases—one of ulceration of the skin, due probably to absence of the liquor amnii; another of warty excrescences; and a third of a subcutaneous abscess on the front of the neck.

C. Ch. Hüter, in his article on the Fœtus in the *Encyclopädisches*

Wörterbuch der medicinischen Wissenschaften, vol. xii. p. 389, Berlin, 1835, made some remarks on ante-natal diseases, more especially in relation to their effect upon the progress of labour; and A. L. Bergmann in the following year published his *Prodromus Pathologiæ et Therapiæ Fœtus Humani Morborum*.

In 1837 appeared a book which must even at the present day be regarded as the standard work on the diseases of the fœtus, namely, *Die Krankheiten des Fœtus*, by J. Graetzer of Breslau. It formed a volume of 272 pages. The following quotation from the author's introduction may here be given as still eminently true:—"A scientific pathology of the fœtus purposes to exhibit not only what diseases have been observed in the fœtus, but also how such disease is modified according to the different stages arrived at in the development of the embryo. . . . But, in spite of the efforts of almost two centuries, it is still very far removed from this ideal. Yes, we are at the present time able to express this tendency only as an ideal, as a pure scientific postulate. There have been observed, indeed, many diseases in the embryo, and most investigators have not been content simply to describe accurately what has been seen, but have almost always sought to apply to the morbid conditions that had been discovered the names that diseases in the adult bear, without having in the remotest degree anticipated the important pathological problems that might be solved in this department." After having given a very good historical sketch of the subject of fœtal pathology, Graetzer proceeded to discuss in turn each disease of the fœtus, giving many references and drawing useful conclusions from the accumulated material. He divided the maladies into *general* and *local*, subdivided the former into *acute* and *chronic*, and the latter he arranged in groups according as they affected one or other of the bodily systems. He adopted, therefore, a classification, partly pathological and partly regional. At the end of the book he found himself in a position to arrange the causes of fœtal disease in eight groups—(1), Dynamic influences, such as atmospheric conditions; (2), mechanical influences, such as falls and blows; (3), a peculiar regimen of the pregnant woman; (4), diseases of the mother before and during pregnancy; (5), diseases of the placenta, cord, membranes, and liquor amnii; (6), the use of certain medicines; (7), psychical influences; and (8), diseases of

the father. Graetzer's was a great work, and well worthy of the high estimation in which it has always been held.

The next writer to contribute anything worthy of note to the subject of intra-uterine maladies was W. F. Montgomery, who, in his article on the Fœtus in Todds' *Cyclopædia of Anatomy and Physiology*, vol. ii. p. 316, 1839, described many of the diseases noted by Graetzer, and added to them many interesting personal observations, of which those relating to fœtal atrophy and spontaneous amputations were especially valuable.

About the same time, when Montgomery was writing his article for Todds' *Cyclopædia*, James Y. Simpson, of Edinburgh, was publishing a series of papers on fœtal morbid states, which were of a high order of merit, and quite worthy of a place alongside of his better known contributions to obstetrics and gynæcology. Amongst these were his paper on "Spontaneous Amputation of the Limbs," in the *Dublin Journal of Medical Science*, 1836; his monograph on "Peritonitis of the Fœtus in Utero," in the *Edinburgh Medical and Surgical Journal* in 1838; and his description of "Ichthyosis Intra-uterina," in the *London and Edinburgh Monthly Journal of Medical Science* for 1843.

W. C. Roberts published two long papers, entitled "Diseases of the Fœtus," in the *American Journal of the Medical Sciences*, vol. xxvi. p. 369, 1839; and vol. ii. (New Series) p. 387, 1841. He did not attempt to do much more than to collate, with some degree of exhaustiveness, previous contributions to this subject, and endeavoured thus to arouse interest in this branch of pathology and medicine upon the other side of the Atlantic.

In the year 1840 two dictionary articles on the diseases of the fœtus appeared in Paris. One was written by Desormeaux and P. Dubois for the *Dictionnaire de Médecine* (vol. xxi., "Œuf humain, Pathologie," p. 577), and the other was published in Fabre's *Dictionnaire des dictionnaires de Médecine* (vol. iv., "Maladies du Fœtus," p. 218). Both articles formed useful compilations, and both considered at some length the interesting condition known as spontaneous intra-uterine amputations.

F. A. von Ammon made an important contribution to fœtal pathology when he brought out his work entitled *Die angeborenen Chirurgischen Krankheiten des Menschen* in Berlin in the year 1842.

This large work, with the valuable atlas that accompanied it, contained much that was teratological; but in it were also to be found good descriptions of such conditions as fœtal dislocations, spontaneous amputations, struma, tumours, and nævi.

The following works, dealing with fœtal pathological states, require little more than a passing notice. They are:—(1.) J. A. Grosse's inaugural dissertation, *De Embryi Morbis*, Berolini, 1842, in which were shortly described both malformations and diseases properly so-called; F. Robert's *Beiträge zu den Krankheiten der Frucht*, Bonn, 1843; S. Bezeth's dissertation of 120 pages, *De Morbis Fœtus*, Lugduni, 1844; J. A. Candiani's thesis, entitled *Cenni sopra alcune malattie del Feto e delle sue dipendenze*, Padova, 1844; and Stephan's dissertation, *De Morbis Fœtus*, Berolini, 1845.

In 1850 appeared a work on the fœtus of considerable importance—*Die Geburten missgestalteter, kranker, und todter Kinder*—by A. F. Hohl of Halle. The writer's own birth had been an interesting one: his mother had borne dead and living children alternately with such regularity that in her eleventh pregnancy no preparations were made for the reception of the child, nevertheless a healthy male infant was born, and lived to write the work above mentioned! The second section of the book was devoted to the diseases of the fœtus; and after he had spoken generally of the symptomatology, etiology, and treatment of such maladies, Hohl went on to describe specially those that had a distinct influence upon the process of parturition. These were rickets, scrofula, syphilis, hydrocephalus, ascites, cystic tumours, enlargement of liver and kidneys, general dropsy, and hypertrophy. The literature of the subjects referred to was fully given, and not a few original cases were reported.

A thesis of Paris, entitled *Des Maladies du Fœtus et de ses annexes*, was published by D. A. Guezenec in 1853, and in the following year appeared the first, and up till the present time the only, separate work in English on the diseases of the fœtus—that by Henry Madge. The full title of this little book of 200 pages was, *The Diseases of the Fœtus in Utero (not including Malformations), with an Outline of Fœtal Development*, and in it the author gave a fairly complete account of some of the maladies of the fœtus which were

then known. The illustrative cases were usually drawn from the French writers, and especially from Mauriceau; but the value of the work would have been greatly increased had complete references to the original sources been given. As a compilation it must be placed below Graetzer's work; but it doubtless helped, as the author hoped it might, to "draw into a neglected field of inquiry an amount of attention equal to the importance of the subject."

A short article upon the diseases of the fœtus was written by J. Copland for his *Dictionary of Practical Medicine*, vol. i. p. 1047, London, 1858; but it formed a comparatively unimportant contribution to the subject, being simply an epitome of the various maladies that had been described in connexion with the fœtus. A thesis of Marburg by W. Raabe—*Die Krankheiten des Fötus*—appeared in 1864; and J. Drouadaine published at Paris, in 1866, a work entitled *De quelques maladies du Fœtus et de ses annexes dans les différentes périodes de la vie intra-utérine.*

Emile Bailly wrote a comprehensive article on the anatomy, physiology, and pathology of the fœtus for the *Nouveau Dictionnaire de Médecine et de Chirurgie Pratiques*, vol. xv. p. 1, Paris, 1872; and Pinard made a similar contribution to the *Dictionnaire encyclopédique des Sciences Médicales*, vol. ii. (4th series), p. 535, Paris, 1878. To Pinard's article is appended a most valuable and exhaustive bibliography by L. Hahn.

An article on "Fötalkrankheiten" by Kleinwächter appeared in Eulenburg's *Real-Encyclopädie der gesammten Heilkunde*, vol. vii. p. 299, Wien und Leipzig, 1886. In this contribution, whilst individual diseases are not described with much fulness, a very good summary is given of all the maladies that have been found affecting the fœtus. Some conditions that are usually regarded as malformations and not as diseases were also considered by Kleinwächter, *e.g.*, hemicephalus, ectopia viscerum, etc.; but this scarcely detracted from the value of the article. It is especially rich in references to the recent literature of fœtal pathology, and is on the whole, although short, the most important compilation on this subject that has been made since Graetzer's time.

Whilst these were the works dealing in a more or less systematic manner with the diseases of the fœtus that have appeared during the last ninety years, very many separate articles devoted to the

consideration of one or other of the individual morbid conditions have also been published. Thus many monographs have had as their subject spontaneous amputations, whilst others have dealt with fœtal rickets, general dropsy, congenital tumours, fœtal syphilis, variola, scarlatina, measles, malaria, puerperal fever, ichthyosis, erysipelas, etc., etc. A full list of these will be appended to the various chapters of this work in which the individual diseases are discussed, for their enumeration here would only needlessly burden this historical sketch.

Something must, however, be said with regard to the works in other departments of medical study in which a more or less extended reference was made to fœtal morbid conditions. Thus many of the text-books upon Pediatrics that have appeared during the present century have devoted a varying amount of space to the consideration of ante-natal maladies. C. B. Fleisch in his *Handbuch über die Krankheiten der Kinder* (Leipzig, 1803-1808), and J. Feiler in his *Pädiatrik* (Sulzbach, 1814), both treated fairly fully of the diseases of the unborn infant. The latter in the first and second sections of his work gave 276 pages to the discussion of the maladies of the fœtus and new-born infant. The fœtal diseases he divided into internal and external, and gave of them an interesting nosological classification. He described congenital lepra, icterus, syphilis, and many other conditions fairly well, but did not make many references to the previous literature bearing upon these subjects. J. C. G. Jörg was another writer who in his *Handbuch zum Erkennen und Heilen der Kinderkrankheiten* (Leipzig, 1826) gave two sections (the third and fourth) to the discussion of the anomalies, diseases, and injuries that might be present in the infant at the time of birth. His views were contained in 129 paragraphs, and although he made the mistake of denying the existence of intra-uterine smallpox, syphilis, and convulsions, yet his contribution to the subject was a memorable one. F. L. Meissner also, in the volumes of his *Forschungen des Neunzehnten Jahrhunderts* (Leipzig, 1826-1834), made frequent references to fœtal morbid states which were more systematically treated in his work entitled *Die Kinderkrankheiten* (1828). A. Henke, J. Wendt, and F. X. Verson, in their text-book on the diseases of children all gave a certain amount of space to congenital

complaints. F. Weber (*Beitrage zur pathologischen Anatomie der Neugebornen*, Kiel, 1851-1854) described in a very thorough manner the diseases met with at birth, as did also A. Bednar (*Die Krankheiten der Neugebornen und Säuglinge*, Wien, 1852), and more recently Max Runge (*Die Krankheiten der ersten Lebenstage*, Stuttgart, 1885). Further, the various writers who contributed to C. Gerhardt's monumental work (*Handbuch der Kinderkrankheiten*), of which the first volume was published at Tubingen in 1877, all paid some attention to congenital morbid states. Other German works upon Pediatrics in which reference to fœtal and neonatal morbid states was made were those of Kaulich, Steiner, Ritter von Rittershain, Fleischmann, Henoch, Vogel, and Bokai; whilst a host of separate articles have appeared in the *Journal für Kinderkrankheiten*, *Oesterreichisches Jahrbuch für Pædiatrik*, *Archiv für Kinderheilkunde*, and in the *Jahrbuch für Kinderheilkunde*.

French writers upon Pediatrics have also contributed much that has a direct bearing upon fœtal pathology. C. M. Billard, in his *Traité des Maladies des Enfans*, Paris, 1828, and in the dissertation on viability which appeared in the third edition of this work (1835), described many extremely interesting cases of congenital disease. Berton, Veron, Valleix, Dumas, Dugés, Bouchut, Barthez, and Rilliet, and more recently Mercier, have all given a certain amount of space to the consideration of ante-natal diseases, and Parrot has added very largely to our knowledge of syphilis, rickets, and athrepsia.

Text-books on diseases of children, written in the English language, have not, as a rule, contained much that related to fœtal morbid states, neither have British pediatrists paid much attention to ante-natal or even to neonatal disease; but there have been certain exceptions to this general rule, for Ryan, in his lectures on the "Physical Education and Diseases of Infants" (*London Medical and Surgical Journal*, 1834-35), considered, at very considerable length, the maladies met with at the time of birth; and C. West, Owen, Eustace Smith, A. Jacobi, Ashby and Wright, Angel Money, Cheadle, Noble Smith, John Thomson, and others, have all written more or less fully upon such matters. Further, in the large *Cyclopædia of the Diseases of Children*, edited by Keating,

not only are there frequent references to congenital diseases, but there is also a special article by B. C. Hirst on the diseases of the fœtus (*v.* vol. i. pp. 217-235).

In the obstetrical text-books of the present century, it has not been uncommon for authors to devote a chapter to the maladies of the fœtus, and especially to those which cause delay in labour. This has been the case with the works of F. B. Osiander, Carus, Scanzoni, Spiegelberg, Barnes, Lusk, Parvin, Playfair, Braun, Schroeder, Winckel, Müller, Tarnier and Budin, Charpentier, and many others; and D. Joulin and A. Herrgott have published separate works on dystocia caused by fœtal morbid states, whilst Priestley has written on the pathology of intra-uterine death. Numerous separate articles have also appeared in the various British and foreign journals devoted in whole or in part to obstetrics.

Medical jurists have also considered the diseases of the fœtus from their special standpoint, and have thus added much to our knowledge of the subject. Mende, Orfila, Casper, Taylor, Hofmann, Tardieu, and Meymott Tidy are all names which deserve honourable mention in this respect. Pathologists also have in some instances devoted their attention to the diseases of the unborn infant, although not to such a large extent as was desirable, and amongst such writers Cruveilhier, Andral, Lobstein, Meckel, Otto, Voigtel, and Ziegler may be named. In this relation it may be noted that special researches upon the passage of morbid products through the placenta from mother to fœtus have been made by Straus and Chamberland, Chambrelent, V. Ott, Wolff, Curt Jani, Bompiani, Krukenberg, Arloing, Cornevin, Thomas, Mars, Pyle, Koubassoff, and many others, to whom an extended reference will be made elsewhere in the course of this work.

Finally, writers who have devoted themselves to the study of Teratology have contributed in no small degree to the advancement of the kindred subject of the diseases proper of the fœtus. In the present century works upon monstrosities have been very numerous, and in nearly all of these some mention was made of fœtal maladies as causes of malformation. It is unnecessary here to enumerate the teratological works of the last ninety years; but the names of such authors as the Saint-Hilaires, Malacarne, Zimmer,

Meckel, Elben, Breschet, Jourdan, Tiedemann, Paget, Devergie, Otto, Holland, Allen Thomson, Beneke, Hallett, Vrolik, Panum, Förster, Braune, Guérin, Davaine, Gurlt, Marchand, Ahlfeld, Dareste, and Taruffi are all worthy of remembrance.

It may also be added that *pari passu* with the general advance in veterinary pathology and obstetrics, that has been a feature of the present century, there has sprung up a literature dealing with fœtal diseases in the lower animals. Franck in his *Handbuch der Thierärztlichen Geburtshülfe*, Berlin, 1876, and G. Fleming in his *Veterinary Obstetrics*, London, 1878, have gathered together much that is of value in comparative fœtal pathology. The full worth of such researches is scarcely yet appreciated, and much may be expected from their pursuit in the future.

It will be seen from what has been recorded in this historical sketch that far greater progress has been made during the present century in the department of the study of fœtal diseases than in any preceding period of time, and yet there remains, I feel sure, an immense field for research comparatively unexplored. It is probable that we now know of the existence of all, or of nearly all the diseases that may attack the fœtus in utero; but we are certainly very far from being acquainted with their etiology, we know little of their true pathological nature, can scarcely at all diagnose them before birth, and are very ill provided with therapeutic means to arrest their progress. Much, therefore, remains to be done by future workers in this department of medicine; and I have gone at some length into the history and bibliography of the subject in order to make these more generally known, and so render the study of fœtal diseases more practicable than it has been hitherto.

CHAPTER VIII.

THE CLASSIFICATION OF THE DISEASES OF THE FŒTUS.

THE METHODS OF DÜTTEL, RAULIN, NOLDE, FEILER, HUFELAND, BILLARD, ZURMEYER, GRAETZER, SIMPSON, ROBERTS, FABRE, MONTGOMERY, GROSSE, SCANZONI, WEBER, MADGE, HOHL, CHARPENTIER, TARNIER AND BUDIN, HIRST, AND KLEINWÄCHTER.

THE classification of diseases has been and still is a matter of the greatest difficulty, and this is especially true of the diseases that affect the fœtus in utero. Nosology has always been an unsatisfactory department of medicine, and from the backward state of our knowledge of ante-natal maladies it becomes almost impossible to construct anything like a systematic arrangement of the various pathological intra-uterine conditions. Diseases may be grouped together into local and general, or into acute and chronic; they may be considered according as they affect this or that region of the body, or this or that system of organs; or they may be divided etiologically. "We may," said Graetzer, "approach Nature from whichever side we please, she always remains the same Proteus." All the above-named plans of classification have been attempted in connexion with fœtal maladies, but no very satisfactory scheme has yet resulted, and it is evident that we must largely increase our knowledge of the nature of many of these diseases before we can hope for such a consummation. Still it will be interesting to review some of the methods of arrangement that have been proposed by different authorities, and it may thereafter be possible to construct a provisional classification that will aid us in our attempt to obtain a systematic conception of the whole subject of the diseases of the fœtus.

The early writers made little or no effort to arrange the morbid conditions met with in the unborn infant in any definite order.

Düttel, for example, simply described in turn variola, measles, syphilis, jaundice, malaria, dropsies, stone in the bladder, epilepsy, umbilical rupture, nævi, and various morbid states ascribed to atmospheric and dietetic conditions. He gave no etiological classification, but we can gather from his dissertation that he regarded all fœtal diseases as due to maternal causes; some, such as smallpox and malaria, he looked upon as transmitted directly from mother to fœtus; others, *e.g.*, umbilical rupture, as caused by traumatism affecting the mother; others, *e.g.*, nævi, as resulting from maternal mental states; and yet others as produced by atmospheric and dietetic irregularities acting through the mother's organism. Schurig also simply placed the diseases above named in a somewhat different order, and added at least one new variety of malady (Uzenbezius' case of frigidity and rigidity of the fœtus, probably an example of the modern sclerema).

Raulin and Nolde both did something towards the establishment of an etiological classification, for the former divided all the diseases into those transmitted from the mother and those peculiar to the fœtus, and the latter arranged them in five groups as follows:—

1. Those due to the father, *e.g.*, syphilis.
2. Those due to the mother, *e.g.*, variola, syphilis, jaundice.
3. Those peculiar to the fœtus, from anomalies of placenta, umbilical cord, etc.
4. Those caused by the presence of a mole in utero.
5. Those due to external conditions, *e.g.*, maternal imagination, traumatism, and drugs given to the mother.

Both the above-named writers noted the overlapping of their subdivisions,—thus Raulin pointed out that cases of fœtal dropsy, smallpox, convulsions, and jaundice might sometimes be placed in the one, sometimes in the other of his two classes. It is specially interesting to note that, as an *etiological* classification, Nolde's has not been much improved upon even up to the present day.

Hoogeveen, although he wrote at much greater length than any of his predecessors, followed closely Düttel's plan, or rather want of plan of arrangement; and the other writers in the last century did little in the way of classification, whilst they nearly all

considered many of the malformations and monstrosities amongst the diseases proper to the fœtus.

Feiler, in the first section of his work on the diseases of children, made the earliest considerable contribution to the nosology of fœtal diseases. His scheme in a somewhat abbreviated form is given below.

I. Internal Diseases of the unborn Fœtus.
  A. Atrophia.
    a. Before the full term;
    b. At the full term.
  B. Intumescentiæ—Dropsy.
    a. Hydrocephalus;
    b. Ascites.
  C. Impetigines.
    a. Jaundice;
    b. Morbus cœruleus;
    c. Syphilis.
      1. General skin diseases;
      2. Leprosy, a variety of lepra Græcorum.
  D. Exanthemata.
    Smallpox.
  E. Comata.
    Apoplexies and suffocative catarrhs.
  F. Spasmi.
    Convulsions.
  G. Adynamiæ.
    a. Blindness, deafness, and dumbness;
    b. Syncope and asphyxia;
    c. Idiocy, imbecility, weakmindedness, cretinism.
  H. Hæmorrhœa.
    Bleeding in utero from tear of cord?
  I. Lithiasis—Stone in the Bladder.

II. External Diseases.
  A. Maculæ.
    a. Various spots on the skin;
    b. Maternal nævi;
    c. Sugillations.

B. Intumescentiæ.
- *a*, *b*, and *c*. Caput succedaneum on head, face, or breech;
- *d*. Cephalhæmatomata;
- *e*. Angiectases;
- *f*. Induration of the cellular tissue;
- *g*. Swelling of mammæ;
- *h*. Fleshy tumour under the tongue.

C. Impetigines—Lepra.

D. Excrescentiæ.
- Warts and caruncles.

E. Ectopiæ.
- Cranial and umbilical herniæ, hydroceles, etc.

F. Amorphiæ.
- *a*. Undescended testicles;
- *b*. Club-feet.

G. Dialyses.
- *a*. Hare-lip;
- *b*. Spina-bifida;
- *c*. Fissure of sternum;
- *d*. Divided scrotum;
- *e*. Fissures;
- *f*. Ulcers;
- *g*. Tearing off of cord in utero;
- *h*. Injuries to eye, vagina, etc., from careless per vaginal examination;
- *i*. Fractures.

H. Symphyses.
- *a*. Various atresiæ;
- *b*. Tongue-tie;
- *c*. Webbed fingers and toes.

I. Monstrositates.
- *a*. Per fabricam alienam—Hermaphrodites;
- *b*. Per situm mutatum;
- *c*. Per defectum;
- *d*. Per excessum.

This scheme, although it erred in the inclusion of many mal-

formations amongst the diseases, and although it was founded upon pathological views now out of date, was more complete and more generally useful than any of those that preceded it, and may even now be consulted with profit.

Oehler's classification was an exceedingly imperfect one, and that of Murat may be described as nothing more than a catalogue; and those of Joerg, Seeligmann, and Hardegg were little if anything better. Hufeland, however, endeavoured to arrange the diseases of the fœtus in a systematic way, and divided them into twelve classes.

1. The Monstrosities.
2. Atrophy, innate Feebleness.
3. Hypertrophy, either of the whole body or of one or several parts thereof.
4. The Dyscrasias, as scrofula, syphilis, variola.
5. Nervous diseases, as convulsions, paralysis, idiocy, etc.
6. Dropsical collections.
7. Inflammatory Congestions and Inflammation.
8. Diseases of the Skin, as boils, pemphigus, etc.
9. Intestinal Worms.
10. Disorganisations and pseudo-organisations, as tumours, enlargement of viscera, etc.
11. Traumatisms, as fractures, amputations, etc.
12. Death of the Fœtus.

Billard in his work on Infants divided their diseases into groups according to the system of organs attacked, and combined with these the maladies occurring before birth; but in his *Dissertation médico-légale sur la viabilité* he adopted an entirely different plan, for here he arranged all the congenital malformations and diseases into three orders: (1), those which were inevitably mortal; (2), those which, without being inevitably mortal, were opposed to the development of independent life; and, (3), those which were not at all opposed to viability. Under these three headings he enumerated all the diseases of the fœtus then known.

Zurmeyer attempted to arrange fœtal maladies in six groups according to their pathological nature, as follows:—

1. Fevers, *e.g.*, intermittent fever.

2. Increased Irritability, *e.g.*, exaggerated fœtal movements.
3. Inflammations, *e.g.*, of brain, spinal cord, lungs, pleuræ, thymus gland, intestine, and peritoneum.
4. Exanthemata, *e.g.*, measles, smallpox, congenital pemphigus, syphilis.
5. Diseases commonly called Cachexiæ, *e.g.*, kirronosis, icterus, dropsy, tubercle, etc.
6. Organic Diseases, *e.g.*, cerebral hernias, cardiac anomalies, aneurisms, dislocations, and fractures.

Far more important and useful than the classification of Zurmeyer was that so modestly advanced by Graetzer. In it he adopted the plan of dividing all the diseases primarily into two classes, general and local; but he looked forward to a time when, with the advance of knowledge, the number of maladies in the second class should be greatly increased at the expense of those in the first. His classification was as follows:—

I. General Diseases.
   a. Of an acute nature.
      1. Fever.
         α. Without material products on the surface of the body: intermittent fever.
         β. With material products on the surface of the body: acute exanthemata, *e.g.*, variola, morbilli, pemphigus.
      2. Inflammations.
   b. Of a chronic nature.
      1. Dyscrasias, the chief products of which are situated in the internal organs: atrophies, hypertrophies, syphilis, dropsy, worms, jaundice, etc.
      2. Dyscrasias, the chief products of which lie on the skin: elephantiasis, and other cutaneous diseases.

II. Local Diseases.
   a. Organic Fluidities.
      1. Blood: scorbutus.
      2. Lymph: scrofula.

b. Purely Vegetative Organs.
   1. Digestive canal: œsophagitis, peritonitis, etc.
   2. Glandular organs in the neighbourhood of the digestive tract: pancreas, liver.

c. Purely Excretory Organs.
   1. Vegetative: urinary organs.
   2. Vegetative-animal: sexual organs.

d. Excitory ("irritable") Systems.
   1. Circulatory organs: heart, bloodvessels.
   2. Respiratory organs: lungs, thymus, and thyroid glands.

e. Animal Organs.
   1. Organs of motion: bones, skin.
   2. Organs of sense-perception: eye.
   3. Organs of mental perception: brain—encephalocele, hydrocephalus, epilepsy.

It will be seen that with regard to the general diseases, Graetzer followed two plans of subdivision: he classified them according to their acute or chronic nature, and according to their internal or external position. The local diseases he considered under the organic systems affected. This classification, therefore, was partly regional, partly pathological, and partly physiological; whilst at the end of his book he also arranged the diseases etiologically—not, however, attempting to do so with exactness. No earlier writer, with perhaps the exception of Feiler, did so much for the systematizing of the maladies of the unborn infant.

In one of the late Sir James Simpson's volumes of manuscript lecture notes, I met with the following classification of the diseases of the embryo and fœtus:—

1. Febrile: ague, dothiénentérie, plague, smallpox, etc.
2. Inflammatory.
3. Cachexiæ: syphilis, chronic eruptions, dropsies, kirronosis, jaundice, purpura, rickets, Bright's disease.
4. Organic: nævi, cystic tumours, carcinoma lithiasis, entozoa.
5. Traumatic: dislocations, fractures.
6. Functional (?).
7. Organic Diseases of the Fœtal Appendages.

Some other schemes of classification require only a passing notice. Roberts arranged the diseases in two groups, according as they were external or internal. In the first division were the congenital affections of the skin, hair, nails, ear, eye, nose, mouth, etc.; whilst in the second were those of the brain, and of the abdominal and thoracic viscera. Fabre discussed fœtal maladies under the following headings:—(1) fractures; (2) dislocations; (3) herniæ; (4) tumours; (5) wounds, cicatrices, spontaneous amputations; (6) serous, purulent, and blood effusions; (7) tubercles; (8) various concretions; (9) inflammation in various organs; (10) diseases of the skin, variola, measles, pemphigus; (11) syphilitic affections; (12) nervous lesions; (13) lesions of nutrition; and (14) lesions of the circulation. Montgomery did not consider fœtal diseases in any definite order, but he looked upon them as divisible etiologically into six groups:—

1. Affections strictly innate in the constitution of the fœtus.
2. Affections communicated by infection from the mother's system.
3. Affections from the father's system, or perhaps through that of the mother, she herself not being affected.
4. Affections from strong mental maternal impressions.
5. Affections from morbid alterations in the envelopes of the ovum, the placenta, or cord, or in the uterus itself.
6. Affections from the influence of external agents, as falls, blows, pressure, etc.

Grosse, in his dissertation *De Embryi Morbis*, arranged the diseases proper of the fœtus in the following manner:—

1. Hypertrophia organorum singulorum vel totius corporis.
   - *a.* Hypertrophia cerebri;
   - *b.* „ sphincteris ani;
   - *c.* „ glandulæ thyroideæ;
   - *d.* „ jecoris.
2. Atrophia.
3. Ectopiæ.
   - *a.* Omphalocele;
   - *b.* Bubonocele.
4. Vulnera.

5. Erythrosis (plethora).
6. Phlogosis.
7. Cyanosis.
   a. Purpura hæmorrhagica, morbus maculosus Werlhofii;
   b. Scorbutus;
   c. Cyanosis cardiaca;
   d. Sclerosis, induratio telæ cellulosæ.
8. Erysipelas.
9. Variola.
10. Impetigines.
    (Amorpha, psoriasis, erythema, ecthyma, strophulus, ephelis, scabies et herpes.)
11. Scrophulosis.
12. Tuberculosis.
13. Hydropes.
    a. Hydrocephalus congenitus;
    b. Hydrorhachitis incolumis;
    c. Hydrocele congenita.
14. Cirrhonosis.
15. Rhachitis.
16. Syphilis.
17. Neuroses.
18. Productiones præternaturales.
    a. Calculi;
    b. Vermes intestinales.
19. Pseudoplasmata.
    a. Tumores cystici et lymphatici excrescentiæ cutaneæ;
    b. Nævi materni.

Grosse's classification, although not free from faults, was a good one; for whilst it enumerated all the known diseases of the fœtus, it omitted nearly all the malformations.

Scanzoni adopted a very simple plan of arrangement, for he classified fœtal diseases into those affecting (1) the brain, (2) the respiratory organs, (3) the digestive apparatus, (4) the urinary system, (5) the circulatory organs, (6) the cutaneous system, (7) the bones, and (8) the nervous system. F. Weber used a still simpler method—the regional—and divided them into the diseases affecting

the head and spine, the thoracic viscera, and the abdominal organs. Madge gave a slight classification founded on etiology, and recognised three groups, of which the first included those diseases received from the parents, the second those peculiar to the fœtus or its appendages, and the third contained those arising from accidents or other causes.

Hohl, however, looked at the subject of fœtal maladies from the point of view of their influence upon labour, and divided them into three groups :—

(1.) Diseases with debility, flaccidity of separate parts or of the whole body.
(2.) Diseases with increase in the circumference of different parts of the body.
  A. Hydrocephalus ;
  B. Hydrothorax and ascites ;
  C. Cystic tumours ;
  D. Enlargement of internal organs.
(3.) Diseases with increase in size of the whole body.
  A. General dropsy ;
  B. Hypertrophy.

Herrgott and Joulin also considered the subject from the purely obstetrical standpoint.

Only two or three other classifications need be mentioned. Charpentier wrote, first, of those fœtal diseases that interfered with labour ; and, second, of the diseases proper : and he divided this second group into ten classes very much in the manner used by Scanzoni—adding, however, special classes for the fevers, for struma, for syphilis, and for fœtal death. Tarnier and Budin made use of the following scheme :—

(1.) Diseases transmitted from the mother.
(2.) Teratological conditions.
(3.) Diseases of circulatory, pulmonary, and cutaneous systems.
(4.) Diseases that give rise to dystocia.
(5.) Diseases not included in the other groups.
  a. Congenital amputations ;
  b. General dropsy ;

c. Spontaneous fractures;
d. Fœtal rickets;
e. Congenital dislocations;
f. Fœtal anchyloses;
g. Congenital tumours.

(6.) Death of the fœtus.

Barton Cooke Hirst made seven classes, of which the first contained the diseases referable to maternal influences; the second, those referable to abnormal conditions of the father; the third, syphilis; the fourth, infectious diseases; the fifth, non-infectious diseases; the sixth, traumatism; and the seventh, the diseases of the fœtal appendages that react injuriously or fatally upon the fœtus itself.

Finally, Kleinwächter devised a scheme of classification, which must be recognised as the best which has yet been proposed. It may, therefore, be given here in full.

1. Hereditary Diseases—the result of maternal maladies.
   - *a.* Acute exanthemata—variola, scarlatina, measles, erysipelas.
   - *b.* Other acute infectious processes.
     - (1.) Puerperal fever;
     - (2.) Typhus,—(*a*) abdominalis, (*b*) exanthematicus, (*c*) recurrens;
     - (3.) Cholera;
     - (4.) Malaria.
   - *c.* Syphilis.
   - *d.* Tuberculosis.
   - *e.* Anthrax.
   - *f.* Parotitis epidemica.
   - *g.* Congenital struma, } perhaps idiopathic.
   - *h.* Congenital carcinoma, }
2. Idiopathic.
   - *a.* Congenital rachitis.
   - *b.* Hydrocephalus, hemicephalus, and spina bifida.
   - *c.* Congenital coccygeal tumours.
   - *d.* Cervical cystomata, etc.
   - *e.* Abdominal ectopia.

f. Enlargement of abdomen.
  (1.) Ascites;
  (2.) Distension of bladder and ureters;
  (3.) Tumours and dilatation of various organs.
g. Hydrothorax.
h. Anasarca.
i. Spinal curvature, anchyloses, adhesions of parts of body with each other.
j. Intra-uterine amputations.
k. Hydramnios (sometimes hereditary).
l. Diseases of heart, kidneys, etc.

3. Surgical.
  a. Fractures.
  b. Dislocations.
  c. Intra-abdominal lesions, *e.g.*, rupture of spleen, liver, or sigmoid flexure.
4. Diseases proceeding from anomalies of the embryonic appendages.
5. Anomalies from an arrested or premature state of development.
6. Developmental anomalies.
7. Poisoning of the fœtus, from strychnia, chloral hydrate, lead, etc., through maternal organism.

I have in the preceding pages spoken of the various classifications of the fœtus in chronological order; it is now necessary to group them together according to the methods used in their construction.

First, There were a number of classifications that were little more than *catalogues* or *enumerations*. The schemes of many of the older authors belonged to this group, and examples of them may be found in the works of Düttel, Schurig, Hoogeveen, Murat, Seeligmann, and Hardegg. So great is now the number of diseases known to affect the fœtus that this form of classification has become unwieldy and almost impracticable.

Second, Some authors attempt to arrange fœtal maladies in groups according to their *pathological nature;* amongst whom may be named Feiler, Zurmeyer, Simpson, Grosse, and Hufeland. If this method

could be accurately carried out it would be an excellent one; but so far as our knowledge goes it is impossible at present to do so. The nature of several fœtal diseases is still unknown, and such a system, whilst its future adoption may be confidently anticipated, must be for the present abandoned.

Third, The *ctiological* method of classification was used by some, *e.g.*, Raulin, Nolde, Montgomery, Madge, and Hirst; but it has several disadvantages which greatly interfere with its usefulness. The etiology of fœtal diseases is a subject about which so little is yet definitely known that it does not lend itself at all easily as a basis of arrangement. Further, from what is known, it would seem that the same fœtal maladies may be due to different etiological factors, so that an undesirable amount of overlapping must exist in any system so founded.

Fourth, Other authors preferred to arrange the diseases according to the *systems of organs*, or the *regions of the body* which they affected. Billard, Roberts, Scanzoni, Weber, and to some extent Charpentier, employed this method. It has the advantage of clearness and compactness; but it lacks accuracy, for certain diseases affect more than one of the organic systems and more than one region of the body.

Fifth, Billard used also a second method of classification, which may be called the *prognostic*. He arranged the diseases in three groups according as they affected the viability of the infant. This plan is of some value and importance to the medical jurist, but is not generally useful.

Sixth, There was the method adopted by some writers, *e.g.*, Hohl, Herrgott, and Joulin, who looked at fœtal diseases from a purely *obstetrical* standpoint. This method, like the last named, has only a limited range of applicability.

Finally, Several authors, as Graetzer, Fabre, Charpentier, Tarnier and Budin, and Kleinwächter, recognising that neither the etiological, nor the pathological, nor the systemic, nor the regional method was altogether satisfactory, attempted, therefore, to form schemes of classification which should *combine the different plans*. Of these writers Graetzer and Kleinwächter were those who were most successful in this attempt; and since the latter wrote some fifty years later than Graetzer, he had the advantage of working under

much more favourable circumstances, and so devised a system of classification which is no doubt nearly the best possible in the present state of our knowledge.

I have for several reasons decided to follow in this work a method of arranging the diseases slightly different from any of those already proposed. Like many of the more recent systems it is founded partly on etiological and partly on pathological details, and to some extent, also, it is a regional classification. In it I have omitted all the conditions which are commonly regarded as malformations and monstrosities, and have reserved them and the pathological states of the fœtal annexa for separate consideration elsewhere. I fully recognise that it is by no means a perfect system; but I trust that it may prove a useful one, and I shall be quite prepared to modify it in the event of fresh researches throwing new light upon the nature of any of the morbid processes occurring in utero.

It is, stated briefly, as follows:—

I. Idiopathic Diseases—those originating, so far as is at present known, in the fœtus itself.
   - A. Diseases affecting chiefly the subcutaneous tissue and skin: General dropsy, elephantiasis congenita cystica, sclerema, ichthyosis, etc.
   - B. Diseases affecting chiefly the osseous system. Fœtal rickets so-called, fractures, dislocations, anchyloses, etc.
   - C. Diseases of the internal organs belonging to the different systems, *e.g.*, the digestive, nervous, respiratory, and circulatory.
   - D. Congenital neoplasms.

II. Transmitted Diseases—those due to disease in the parents.
   - A. The fevers and other infectious processes.
   - B. Syphilis, etc.

III. Traumatic Morbid States, the results of injuries received either during pregnancy or in labour.
   - A. Of the region of the head and neck.
   - B. Of „ „ thorax.
   - C. Of „ „ abdomen and pelvis.
   - D. Of the limbs.

IV. Toxicological Conditions, resulting from the administration of medicinal or poisonous substances to the mother.

V. Death of the Fœtus, and post-mortem appearances in—

A. Dissolution.

B. Mummification.

C. Maceration.

D. Putrefaction.

It may be confidently anticipated that the number of idiopathic diseases will gradually grow smaller as more is learnt concerning the effect of maternal and paternal states upon the fœtus, and that the second division of the classification will grow larger at the expense of the first. Even now there are certain diseases, such as the so-called congenital struma and congenital carcinoma, for which it is almost necessary to form an intermediate group between the first and second classes. Again, certain of the states found after intra-uterine death would seem to be more probably of the nature of diseases than of simple post-mortem alterations. For these and for other reasons the plan of classification given above must be regarded as a provisional one; there can be no finality in the present state of our knowledge of ante-natal disease.

The rest of this volume will deal with some of the Idiopathic Diseases in sub-section A., viz., those affecting the subcutaneous tissue.

CHAPTER IX.

GENERAL CHARACTERS OF FŒTAL DISEASE.

INTRA-UTERINE IMMUNITY—POTENTIAL MORBIDITY OF THE FŒTUS—POTENTIAL MORTALITY—THE UTERUS A FORCING-HOUSE FOR SOME DISEASES—DISEASES PECULIAR TO THE FŒTUS, FŒTAL RICKETS, INTRA-UTERINE ICHTHYOSIS—DISEASES OF THE EMBRYO—IDIOPATHIC DISEASES OF THE FŒTUS—AFFECTIONS OF THE SUBCUTANEOUS AND CUTANEOUS TISSUES.

THE foregoing chapters on the history and classification of fœtal diseases will have, in some measure, acquainted the reader with the maladies that are met with in intra-uterine life; but it may be well, before proceeding to consider these diseases in detail, to introduce here some general remarks bearing upon their characters.

The situation which the fœtus occupies in the body of the mother is no doubt the cause of that immunity from several pathological conditions which it enjoys. It is immediately surrounded by the liquor amnii, which, serving as a natural water-cushion, protects it from sudden shocks and jars; the uterine walls, by their growth and distensibility, allow increase in size and freedom of movement to the fœtus, whilst they shield it from harm, and maintain by their vascularity that constant temperature so needful for healthy development; and, external to the uterus, are the partly osseous, partly muscular, pelvic and abdominal walls, which serve still further to secure the safety of the embryo in utero. The presence of such environmental conditions doubtless accounts for the comparative rarity in fœtal life of surgical injuries, of certain skin diseases, and perhaps also of inflammatory states. The absence, on the other hand, of any one of them inevitably leads to pathological processes. Thus, if the fœtus be developed outside the uterus in an extra-uterine gestation sac, it is often found to be morbid; if the liquor amnii be deficient, erosions, adhesions, and possibly spontaneous amputations may occur; and if anything

happen to destroy the integrity of the placenta and membranes evil results to the fœtus surely follow.

Whilst all this is undoubtedly true, and whilst a degree of immunity to some diseases certainly exists, it is also true that all investigations have gone to show that the fœtus in utero may suffer from many maladies from which the early observers regarded it as free. Further, it would seem that in some cases the freedom from disease is only apparent, for it is certain that morbid states may be latent in intra-uterine life and become active at or soon after birth. The conditions in utero were not favourable for their development; those existing outside the uterus rapidly led to their appearance in full virulence. For at birth great changes occur, not only in the environment, but also in the structure of the infant. Organs that have been quiescent and functionless in intra-uterine life—such as the lungs, stomach, and probably also the kidneys and skin—then become important factors in the maintenance of life or health. Should any of these organs which at birth are called upon to play a part in the physiological processes of the body be inherently weak or prone to disease, then a departure from the normal standard of health occurs, and death may and often does ensue. This interesting tendency I have named *the potential morbidity of the fœtus*, and œdema neonatorum is a disease which may be cited as an example of its mode of action, and there are many others.

There is another and a somewhat similar tendency, which may be termed the *potential mortality of the fœtus*. Certain diseases may exist before birth, and yet the life of the fœtus may continue and development go on. With the occurrence of birth, however, the infant finds itself in conditions in which it is not possible for its diseased organs to continue to conserve life. What was possible *in utero* becomes impossible in the extra-uterine state. What was compatible with life and development so long as the infant lay in the uterus becomes the cause of death when organic severance from the maternal economy has taken place. This is one of the reasons why so many deaths occur during the first week of life and so many infants are still-born. As an example of this potential mortality, general fœtal dropsy may be given. Two fœtuses suffering from this disease which came into my hands

showed signs of life at birth, but in a few minutes death supervened. The dissection revealed anasarca, fluid in the pericardial, pleural, and peritoneal cavities, and an anæmic state of the viscera, with slight splenic enlargement. The general dropsy, therefore, was compatible with an intra-uterine, but not with an extra-uterine, existence. I have found no record of a fœtus with general dropsy that lived more than a few hours after birth. Under good hygienic conditions the tendency to death may in some cases be checked or altogether abolished, but with other diseases extra-uterine life under even the best environmental circumstances becomes impossible.

Further, the states that lead to death at the time of birth may in some instances be looked upon as normal when regarded from the point of view of intra-uterine development. A fœtus a little above the average size can only in a very limited sense be considered as pathological; it is, indeed, "well-developed," and yet this very stage of great development may lead to its still-birth or death. The large head cannot pass through the maternal passages without suffering such a degree of compression as leads to intra-cranial hæmorrhage, with all its results—asphyxia neonatorum in some cases, cerebral palsy in others. Again, the shoulders may be so broad as to cause delay in the labour after the birth of the head, and thus still-birth may for this reason also be the consequence. Further examples might be given, but enough has been said to show that, in many instances, conditions of the fœtus which were harmless or even normal *quâ* the fœtus, become dangerous, if not fatal, *quâ* the new-born or young infant.

It must not, however, be forgotten that there is another side of the question. Some conditions which may be the cause of great danger to the fœtus *in utero* cease to be so the moment the child emerges from the maternal passages. Not long ago I saw an infant that had been born into the world puny and weak. The cause was looked for, and was found in the presence of a partially diseased placenta. After birth, the infant with care lived and throve. The threatening and dangerous intra-uterine condition was removed when the umbilical cord was ligatured and the infant thus separated from the placenta. The defective supply of nourishment and the inefficient respiration were replaced by the normal

extra-uterine digestive and pulmonary functions, and the change was beneficial. I have recently met with two cases which illustrated this possibility very well. In the one instance a child was born dead, and the cause was found in the presence of a tight knot on the umbilical cord, for through the umbilical vein mercury could not be forced. In the second case, I delivered a woman of a living infant on whose cord there was a loose knot. Now had this knot been drawn tight enough to stop the circulation this child must have shared the fate of the first. Real morbidity in the fœtus, then, may be checked or abolished by the change from an intra-uterine to an extra-uterine existence. This may not often occur, but that it does happen sometimes is not doubtful.

There is another peculiarity about some fœtal diseases to which a brief allusion may here be made. It would seem that some morbid conditions develop more rapidly and reach a more advanced stage *in utero* than they ever do in extra-uterine life. The uterus acts as a forcing-house for them. For example, Sänger* has described a disease under the name of *congenital leukæmia*, and has pointed out that, judging from the stage it had reached at the time of birth, it must have developed with much greater rapidity *in utero* than it ever does in the adult state.

If the preceding statement be accepted—and it cannot, I think, be denied—then it may also be regarded as probable that the fœtus may suffer from certain diseases that are not met with at all in extra-uterine life. It may, in fact, have diseases altogether peculiar to itself. This is undoubtedly true of many monstrosities; but it is also, I think, true of a small number of fœtal diseases properly so-called. The malady commonly known as fœtal rickets is a case in point. Congenital rickets does, I believe, occur; but the morbid state that has been called fœtal rickets probably includes conditions that are not those of true rachitis, but some pathological entity peculiar to ante-natal life. This hypothesis has been already accepted by some authors who have coined new names for the diseased process: Parrot,† for example,

* Sänger (M.), *Archiv für Gynäkologie*, vol. xxxiii. p. 198 1888.

† Parrot, *Bullet. de la Société d'Anthropologie de Paris*, p. 296, 1878.

has called it *achondroplasia;* Kaufmann,* *chondrodystrophia;* and Symington and Thomson,† *defective endochondral ossification.* What has been said with regard to fœtal rickets may be repeated in connexion with the so-called ichthyosis intra-uterina, and some other ante-natal skin diseases. It is, on the whole, to be regretted that writers have hastily, and from certain superficial resemblances, given to fœtal maladies descriptive names used in the nomenclature of adult diseases.

It must be confessed that little is known with regard to morbid conditions in the *embryo;* but that these exist is beyond doubt. Further investigation will probably show that embryonic diseases are more interesting and have a more direct bearing upon the ultimate problems of pathology than have even fœtal maladies. No doubt the diseases of the embryo will also be found to differ much from those of both fœtal and extra-uterine existence, for the physiological conditions that exist before the formation of the placenta are not the same as those which are met with in the later months of intra-uterine life or in the adult. The physiology of the embryo differs from that of the fœtus, and since physiological processes always underlie and influence pathological developments, —penetrate them through and through (*durch und durch durchdringen*), to use Graetzer's powerful expression,—it is reasonable to conclude that the pathology of the embryo will not in all points be the same as that of the fœtus. But embryonic diseases have scarcely yet been seriously studied in the human subject, although observations in comparative pathology bid fair to throw much light upon them, and to encourage research in this direction. The curious morbid conditions which have been artificially produced in the embryo chick in the earliest hours of development by Dareste and others are extremely interesting, and their study cannot fail to be of great value in the elucidation of the pathological states that may be met with in the human embryo.

* Kaufmann (E.), *Untersuchungen über die sogenannte fœtale Rachitis.* Berlin, 1892.

† Symington (J.) and Thomson (H. A.), *Laboratory Reports of the Royal College of Physicians, Edinburgh,* vol. iv. p. 237, 1892.

Idiopathic Diseases of the Fœtus.

The first large class of fœtal diseases which falls to be considered in detail in the succeeding chapters is that which contains the idiopathic maladies. These conditions we must for the present regard as originating in the fœtus itself, as in some instances peculiar to it; but no doubt this class will in time be greatly diminished in size. Many of the diseases that we are at present forced to regard as idiopathic will through further study be found to belong to one or other of the classes into which the maladies of the fœtus have been divided. Fœtal rachitis and fœtal dropsy, for example, may before long be found to be due to peculiar morbid states of the maternal organism, or to pathological tendencies transmitted from the father, and so it may in the future be necessary to transfer them to the second class, that containing the hereditary or transmitted maladies. But in the meantime the arrangement is a convenient one, and permits of the introduction of some degree of system into the study of the diseases of fœtal life.

The first group of the idiopathic diseases contains a number of exceedingly interesting conditions affecting chiefly the subcutaneous tissues and the skin, but accompanied also by important alterations in many of the internal organs. Amongst the members of this group are general fœtal dropsy or anasarca (in the single fœtus and in the twin), elephantiasis congenita cystica universalis, sclerema neonatorum which is sometimes congenital, œdema neonatorum, and ichthyosis intra-uterina. These which we may for the present call diseases of the subcutaneous tissue form a natural group, the members of which have certain resemblances to each other. General dropsy in the twin fœtus is probably closely connected with elephantiasis congenita cystica, the latter has resemblances to the diseases known as cystic hygroma, fibroma molluscum, and congenital struma; and intra-uterine ichthyosis and sclerema neonatorum have perhaps characters in common. Several of these maladies have been met with in the lower animals, and the study of their comparative pathology has, as will be shown, thrown some light upon their nature. The succeeding chapters of this volume will be devoted to the consideration of some of them.

CHAPTER X.

GENERAL DROPSY OF THE FŒTUS.

GENERAL DROPSY—DEFINITION—SYNONYMS—HISTORICAL NOTE—VARIETIES—FREQUENCY—DESCRIPTION OF CASES AND SPECIMENS.

General Dropsy is one of the most interesting of fœtal diseases. It is also one that was observed as far back as the beginning of the seventeenth century—indeed, a case of it may have been seen by the Father of Medicine himself. It presents for solution a very large number of intricate pathological problems, and many monographs and communications have been written dealing with these. Further, the theories that investigators have brought forward to explain its nature and origin have been very various, and some of them have been most ingenious; but it is doubtful whether any one has yet discovered its ultimate pathogenesis.

I shall first describe the specimens and cases that I have myself seen, and shall thereafter deal with the observations of others.

During the last few years four cases of general dropsy of the fœtus have come under my notice; in two of these cases I was fortunate enough to obtain the specimens for dissection, but in the other two I was able to get only their clinical history. Three of the fœtuses were the offspring of the same patient, and the fourth was the child of her sister-in-law. The first fœtus (Specimen A) was examined by the frozen sectional method for the special purpose of demonstrating the position of the dropsical fluid and of the organs; drawings of these sections were shown to the Obstetrical Society of Edinburgh in 1887. The second fœtus (Specimen B) was investigated by simple dissection, and the tissues

were specially examined with a view to demonstrating their microscopic characters.

Definition of General Dropsy of the Fœtus.—It is impossible to frame a satisfactory definition of this fœtal malady; for the cases which have been recorded by various authors present differences so wide as to suggest that we are here dealing, not with a pathological entity, but with a group of symptoms common to several different morbid conditions. It may, however, for convenience be defined as a rare condition of the fœtus, characterized by general anasarca, by the presence of fluid effusions in the peritoneal, pleural, and pericardial sacs, and usually by œdema of the placenta; and resulting in the death of the fœtus or infant before, during, or immediately after birth. It is to be distinguished from such conditions as ascites or peritonitis of the fœtus, œdema neonatorum, congenital elephantiasis, and fœtal syphilis. I believe that it is also to be differentiated from the condition known as hydrops sanguinolentus fœtus. At the same time, I believe that some of the specimens which have been described by authors as examples of fœtal peritonitis and hydrops sanguinolentus have really been instances of general fœtal dropsy in infants that have died in utero.

Synonyms.—Various names have been given to this group of symptoms. *General dropsy of the fœtus* is perhaps that most commonly used—the "*hydropisie généralisée du fœtus*" of the French writers, and the "*Haut- und allgemeine Wassersucht*" of the German authors. It has also been called *general fœtal œdema, fœtal ascites and anasarca, dropsy and gelatinous anasarca of the fœtus, serous effusions in the fœtus,* and *universal dropsy of the fœtus* (hydrops universalis fœtus).

Historical Note.—The literature of the subject will be detailed at the end of Chapters XII. and XIII.; but a *résumé* of the history of the disease may here be given. It has been supposed by some that Hippocrates was speaking of a case when he described the birth of a fleshy fœtus (fœtus carnosus); but it was not till the seventeenth century was reached that records of undoubted cases appeared. They were those of Louyse Bourgeois, Plater, Severin, Seeger, and Dorstenius. In the eighteenth century, the condition was discussed by Düttel and by Lavaterus; Lospichlerus and De la Motte each

described a case; Schurig noted one case of his own, and gathered together those related by other authors; and Bianchi of Venice described it in a case of triplets. In the early part of the present century F. B. Osiander, Carus, Lamouroux, Billard, Seulen, and Hufeland reported cases; Graetzer and Hohl of Halle described the disease in their interesting works on fœtal maladies; and Cruveilhier gave notes of two cases which occurred at the Paris Maternity. Among the cases of fœtal peritonitis recorded by Sir J. Y. Simpson were one or two which were possibly examples of general fœtal dropsy; and this remark applies also to West's cases, and to some of those described by other authors (*e.g.*, Pollnow) under the name of hydrops sanguinolentus fœtus. During the last forty years there have been several important contributions to the literature of this subject: cases were described by Weber, Ferris, Keiller, Thomas, Tamm, Goldmann, Walker, Clay, Burton, Betschler, and Ritter, between the years 1850 and 1870, and of these the two cases fully detailed by Betschler were perhaps the most valuable; Joulin and Herrgott considered the condition among the causes of delayed labour; in the years 1875-7 appeared a series of cases in the London Obstetrical Society's *Transactions*, narrated by Protheroe Smith, Lawson Tait, Snow Beck, and John Bassett; Schütz, Klebs, Spiegelberg, Jackesch, Strauch, Braun, Habit, Nieberding, Ahlfeld, Behm, Ruge, Hönck, Sänger, Lohlein, Cohn, and Fuhr have written upon it in Germany; Angus Macdonald and A. R. Simpson showed specimens of it to the Edinburgh Obstetrical Society, and I exhibited to the same Society the sections of my first case in the year 1887; Chiara, Pinzani, and Raineri have contributed cases from Italy; and Taruffi of Bologna has discussed the condition in his large compendium of Teratology; in some recent text-books on Midwifery it has been referred to (*e.g.*, *Tarnier* and *Budin, American System of Obstetrics*, etc.); Dareste has thrown some light upon its causation in his teratogenic studies on the hen's egg; and Smith and Birmingham have described a case of it in which the thoracic duct was absent. Longaker, Osler, and Gueniot have also noted cases.

Varieties.—I have, for etiological reasons to be afterwards detailed, divided the cases of general fœtal dropsy into two primary groups, in one of which the disease occurs in the single fœtus, and

in the other in one of twins or of triplets. The further subdivision of these groups is, however, necessary, and will be referred to again when the pathogenesis of the state is considered.

Frequency.—There can be no doubt that general fœtal dropsy is an extremely rare condition. I have been able to collect together the records of little more than sixty cases. To these must be added the cases of general dropsy in malformed twin-fœtuses which are found scattered throughout medical literature, and in which the dropsical state has not been specially emphasized by the writers; but even these are few in number.

Description of Cases and Specimens of General Dropsy in the Single Fœtus.

The first specimen of general fœtal dropsy which came into my hands for examination was kindly given to me by Professor Simpson, to whom it had been sent by Dr Freeland in March 1887. Since that year Dr Freeland's patient has given birth to two other dropsical fœtuses, and her sister-in-law has given birth to one; of these three specimens, one has come into my possession.

Obstetrical and Clinical History of Dr Freeland's Cases.—Mrs A., now 37 years of age, has had an interesting obstetrical history, of which the following are the chief details. Her two first pregnancies resulted in the birth of full-time healthy infants, who are now alive and well. Her third, fourth, fifth, sixth, and seventh pregnancies terminated prematurely between the sixth and seventh month; the infants were still-born on all these occasions, but no autopsy was made upon any of them. The eighth pregnancy also came to an end between the sixth and seventh month, and it was noted that the placenta was "extensively diseased." During the ninth gestation the patient was put upon a course of chlorate of potash, in the hope of enabling her to carry to the full term a living child; but between the eighth and ninth months premature labour set in, and a male infant with general dropsy was born. This fœtus (Specimen A) was examined by me by the frozen sectional method. The labour had been easy and rapid, for the woman had been delivered before Dr Freeland arrived at the house. There had been hydramnios in a very marked degree. The infant's heart

beat for a few minutes after birth, but there was no attempt at respiration. The placenta was large, pale, and œdematous. The puerperium was quite normal, and there was not, and had not been during pregnancy, any albuminuria. Soon after this a tenth pregnancy occurred, and this resulted in the birth of a full-time dropsical infant that lived about twenty minutes. Dr Freeland was not present at the confinement, and did not see the infant; but he was told by the mother that it was exactly similar to the one above mentioned. "It was," she said, "a fine, well-formed child, but full of water." Her next pregnancy came to an abrupt conclusion at the seventh month; the fœtus was dead, with the skin peeling. The twelfth pregnancy terminated on December 13th, 1891, in the birth of a six months' dropsical fœtus, with a placenta exactly similar to that in the eighth pregnancy. This fœtus is named hereafter Specimen B. Dr Freeland was sent for early in the morning of December 13th, when he found that Mrs A. had had an extensive hæmorrhage, and had all but fainted. Fœtal movements had been felt for two or three weeks previously, and also on the previous evening. The vagina was plugged, as there were no labour pains; six hours later labour set in, and when the plug was removed the os was found to be about the size of a penny. Dr Freeland soon after ruptured the membranes, and a foot (the right) came down; traction on this caused a tearing of the tissues at the ankle. Uterine pains and hæmorrhage now ceased, but recommenced seven hours later. The breech now passed easily through the os, and a female fœtus was soon completely born. There was marked hydramnios. No difficulty was experienced in removing the placenta, but on lifting it by the cord the latter broke across. The puerperium was normal. She had last menstruated on June 6th, and her pregnancy, therefore, had advanced as far as the sixth month.

Both the patient and her husband were very anæmic in appearance; but she had always, she said, enjoyed good health. In her pregnancies it was only after quickening had occurred that she began to feel swollen, uncomfortable, and as if there was great pressure about the lower part of the right side of the abdomen. There was no evidence of renal disease. The question of syphilis was carefully inquired into, but absolutely no history or sign of

General Dropsy of Fœtus, Case A ($\frac{2}{5}$ Nat. Size).

that disease could be found either in the woman or her husband. Further, neither her mother nor her sister had ever had still-born infants or abortions. Dr Freeland, however, accidentally discovered the following curious circumstance:—The patient's brother, who had exactly the same waxy anæmic look, was married to a thoroughly healthy woman. She had been six times pregnant by him, and each gestation had ended in an abortion. Her seventh pregnancy went to the full term, when she was delivered of a still-born dropsical infant. Dr Freeland was so much struck by the resemblance between this child and that of Mrs A. that he remarked upon the circumstance, and then, for the first time, learned that the women were sisters-in-law. Unfortunately this second patient soon after left the district, and her history was not obtainable; but it was heard that she had had an eighth pregnancy, which had also terminated in the birth of a still-born infant, whether dropsical or not is unknown. There were no alcoholic tendencies in Mrs A.'s case, but there were such in that of her sister-in-law.

Morbid Anatomy of Specimen A.

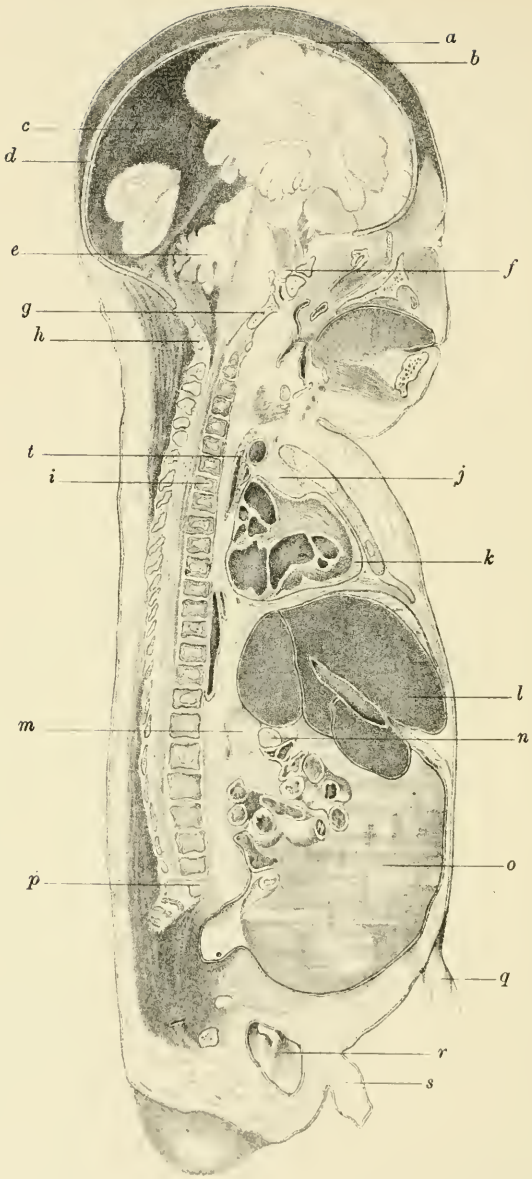
A. *External Appearances.*

In the case of this first specimen, I had a water-colour sketch made of it before placing it in the freezing mixture. This was done in order to bring out the external appearances which it presented at that time (Plate I.). In this sketch the swollen state of the abdomen and the general condition of anasarca are well represented, as are also the œdematous, glossy, and pinkish appearance of the skin all over the body, and the deepening of the grooves at the flexures of the limbs. The œdematous state of the subcutaneous tissue of the forehead and eyelids has reduced the eyes to mere slits, and has caused a deep groove above the root of the nose. The mouth is seen to be partly open, and the tongue protrudes to a slight extent. The great œdema of the hands and feet has given to these parts a swollen, almost deformed appearance. The anasarca, whilst general over the whole body, is seen to be specially well marked in the regions of the thorax, abdomen, scrotum, and thighs. The umbilical cord also is swollen and œdematous. The bones and sutures of the

cranium could hardly be felt on account of the œdema. The pressure of the finger made the skin to pit all over the body, and the presence of a large quantity of fluid in the abdomen was evident on palpation. There were no bodily deformities, such as talipes, spina bifida, imperforate anus, etc.

The *measurements* of the fœtus were as follow: — The total length from vertex to heel was 17 inches (43 cms.); that from vertex to symphysis pubis was 11 inches (28 cms.) The circumference of the abdomen was 16 inches (40·5 cms.), and was about 3 inches greater than that of the head. The cranial diameters were: Maximum, $4\frac{3}{4}$ inches (12 cms.); O.M., $4\frac{1}{4}$ inches (10·8 cms.); O.F., 4 inches (10 cms.); and s.O.B., 4 inches. The transverse measurement in the thoracic region was 4 inches, and the antero-posterior $3\frac{1}{8}$ inch (7·8 cms.); in the region of the abdomen the transverse was $5\frac{1}{2}$ inches (14 cms.), and the antero-posterior $3\frac{5}{8}$ inches (9·2 cms.).

The Placenta and Membranes.—The placenta had a diameter varying from $7\frac{1}{2}$ to $6\frac{3}{4}$ inches (19 to 17 cms.). It was rather thick relatively to its size, measuring at some points nearly 2 inches (5 cms.). The point of insertion of the cord was eccentric, being only $2\frac{1}{2}$ inches from one border of the placental mass. The uterine surface of the placenta had a very characteristic pale, anæmic, and gelatinous appearance; and its tissue was very friable, so much so that at the time when the specimen came into my hands the placental lobes were torn in several places. A large quantity of clear, viscid fluid drained away from the placenta into the vessel in which it was kept. Near the margin of the placenta at one spot was a partially decolorized blood-clot about 1 inch in thickness, and having a diameter of about 2 inches. The fœtal surface of the placenta was most evidently anæmic. Its bloodvessels, save at the point of insertion of the cord, were collapsed, and were difficult to trace, for they did not stand out in the usual way as dark lines. The *amnion* was normal in appearance, perhaps a little less transparent than usual; but the *chorion* was distinctly thickened, and on its uterine surface there were very evident traces of decidual remains in the form of reddish patches. The *umbilical cord* measured $20\frac{1}{2}$ inches (52 cms.) in length, and its circumference was about



Vertical Mesial Section of Fœtus with General Dropsy
($\frac{1}{2}$ Nat. Size).

DESCRIPTION OF PLATE II.

Vertical Mesial Section of Fœtus with General Dropsy, left face shown. ($\frac{1}{2}$ natural size.)

a, Anterior fontanelle; *b*, Œdematous scalp tissue; *c*, Hæmorrhage in falx cerebri; *d*, Posterior fontanelle; *e*, Cerebellum; *f*, Pituitary body; *g*, Basi-occiput; *h*, Posterior arch of atlas; *i*, First dorsal vertebra; *j*, Thymus gland; *k*, Fluid in pericardium; *l*, Liver; *m*, Pancreas; *n*, Pylorus; *o*, Fluid in peritoneum; *p*, First sacral vertebra; *q*, Umbilical cord; *r*, Tunica vaginalis testis; *s*, Penis; *t*, Trachea.

3½ inches. It was thick but pale, and its bloodvessels were nearly quite empty, the vein alone containing a small quantity of blood-clot. The jelly of Wharton was present in large amount.

B. *Pathological Appearances of the Viscera, etc., in Specimen A.*

I. *Naked-Eye Appearances.*—In this specimen, as has been already said, the sectional method of investigation was employed. The infant was placed in the freezing mixture in the dorsal posture. The thighs were not markedly flexed, but were slightly abducted and rotated outwards, and the head was partially flexed upon the sternum. When the body was frozen, sections were made with the saw in different planes, and the appearances seen were traced and sketched whilst the dropsical fluid was still in a frozen condition. By means of these sections, which were in both the vertical and transverse planes, the salient points in the morbid anatomy were revealed, and the position of the fluid defined in a way that by no other method could have been achieved.

The following were the sections which were made and drawn:—

a. Vertical sections—

1. Mesial sagittal section of head and trunk, left face. Plate II.
2. Mesial sagittal section of head, right face.
3. Mesial sagittal section of pelvis, right face.
4. Lateral sagittal section of head and trunk, ¾ inches to the left side of No. 1, right face shown. Plate III., Fig 1.
5. Lateral sagittal section of head and trunk in same plane, left face shown.

b. Transverse sections—

6. Horizontal section of right half of body at level of 7th cervical vertebra.
7. Horizontal section of right half of body at level of 5th dorsal vertebra.
8. Horizontal section of right half of body at level of 1st lumbar. Plate III., Fig. 2.
9. Horizontal section of right half of body at level of cartilage between 1st and 2nd sacral vertebræ. Plate III., Fig. 3.

From the study of these sections, and from such further dissection as was necessary, the regional anatomy and pathological appearances of the viscera in this fœtus were determined.

Vertebral Column.—The spinal canal and cord were intact, and normal in size and form; the ossification of the vertebræ was well advanced for the age at which the fœtus had arrived; the upper part of the spine was nearly straight, whilst the lower dorsal region showed a distinct anterior bulging, the lumbar portion a slight concavity anteriorly, and the sacro-coccygeal part had its usual slight anterior concavity; the curves of the spine were due to the position in which the infant had been frozen, and probably also to the ascites. The various regions of the spine bore to each other the usual relationship as regards length which is found in the premature infant; that is to say, the dorsal region was nearly twice as long as the cervical, whilst the lumbar was practically equal in length to the cervical. The total length of the spine was 16 cms., the cervical region was 3·5 cms., the dorsal 6·5 cms., the lumbar 3·3 cms., and the sacro-coccygeal 2·7 cms.

The Region of the Head.—The tissues of the scalp were markedly infiltrated with blood-stained serum, but there was no special caput succedaneum. There was little head-moulding, and the absence of caput and of head distortion was due no doubt to the easy character of the labour. The bones of the head were well ossified, and there was no undue distension of the cerebral ventricles with fluid; there was, therefore, no sign of hydrocephalus. In the cartilage between the post-sphenoid and basi-occiput there was the trace of a canal, probably the remnant of the canalis cranio-pharyngeus. The inclination of the basis cranii to the horizon was normal; the brain was well formed in all its parts, and its convolutions and fissures bore a normal relation to the sutures of the cranium. There was a blood effusion into the falx cerebri and tentorium cerebelli—a meningeal hæmorrhage probably due to the diseased state of the placenta and fœtus, and not to any special pressure on the head during labour. In the region of the face the only abnormality was the presence of great subcutaneous œdema, especially under the chin. The tongue was partially protruded from the mouth.

The Region of the Neck.—The structures in the neck were

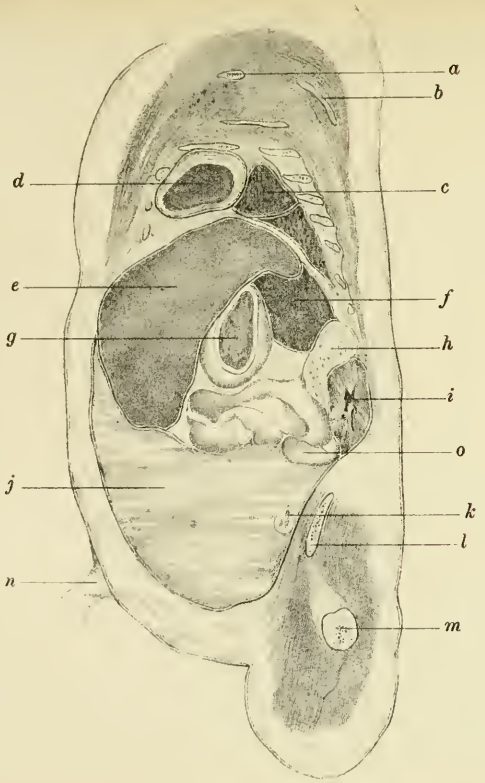
DESCRIPTION OF PLATE III.

FIG. 1.—Left lateral sagittal Section of Fœtus with General Dropsy, right face shown. ($\frac{1}{2}$ natural size.) *a*, Clavicle; *b*, Scapula; *c*, Left lung; *d*, Heart, left ventricle; *e*, Liver; *f*, Spleen; *g*, Stomach; *h*, Left supra-renal capsule; *i*, Left kidney; *j*, Fluid in peritoneum; *k*, Sigmoid flexure; *l*, Ilium; *m*, Head of left femur; *n*, Umbilical cord; *o*, Intestine.

FIG. 2.—Transverse Section at levelof first Lumbar Vertebra. ($\frac{1}{2}$ natural size.) *a*, First lumbar vertebra; *b*, Vena cava inferior; *c*, Duodenum; *d*, Gall bladder; *e*, Liver; *f*, Fluid in abdomen; *g*, Œdematous tissue of abdominal wall; *h*, Right kidney.

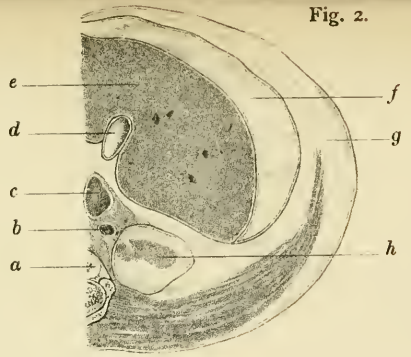
FIG. 3.—Transverse Section at level of first Sacral Vertebra. ($\frac{1}{2}$ natural size.) *a*, First sacral vertebra; *b*, Rectum; *c*, Ureter; *d*, Ileum; *e*, Abdominal fluid; *f*, Œdematous tissue.

Fig. 1.



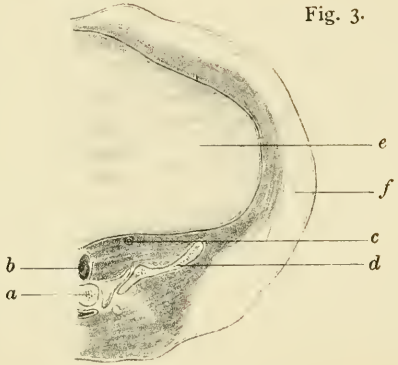
Left Lateral Sagittal Section of
Dropsical Infant, right face shown ($\frac{1}{2}$ Nat. Size).

Fig. 2.



Transverse Section at level of
1st Lumbar Vertebra.

Fig. 3.



Transverse Section at level of
1st Sacral Vertebra.

normal, save with regard to their position; they were all displaced upwards to some extent. The hyoid bone, which normally lies at the level of the third cervical vertebra, lay opposite to the body of the axis. The larynx, which should extend from the level of the junction between the body and odontoid process of the axis to that of the fifth cervical vertebra, was found in this case to reach from the level of the upper border of the atlas to that of the disc between the third and fourth cervical vertebræ. The trachea was found to bifurcate opposite to the body of the second dorsal vertebra, *i.e.*, one vertebra higher than is normal at birth. The trachea was 3 cms. in length, the normal measurement; the thyroid gland was normal; the thymus gland extended a little higher in the neck than is usual; and the left innominate vein crossed over the trachea at the level of the sixth cervical vertebra. The relatively high position of the structures in the neck was no doubt mainly due to the presence of fluid in the abdomen.

The Region of the Thorax.—The thoracic viscera and the anterior thoracic wall were displaced upwards; the upper margin of the sternum lay at the level of the sixth cervical vertebra; the tip of the ensiform cartilage lay opposite to the body of the sixth dorsal vertebra, and was tilted forwards,—indeed, the whole of the lower half of the sternum was displaced forwards as well as upwards. The distance between the manubrium sterni and the spinal column was 1·5 cms., whilst that between the tip of the ensiform and the body of the sixth dorsal vertebra was 5 cms. In a normal infant the corresponding measurements were 2·5 and 5·2 cms., and in that case the manubrium lay opposite to the first dorsal vertebra and the tip of the ensiform at the level of the tenth dorsal vertebra. The central tendon of the diaphragm lay opposite to the body of the sixth dorsal vertebra, instead of at the level of the disc between the eighth and ninth dorsal vertebræ, its normal position at birth. All the internal diameters of the thorax were smaller than normal, but they were not proportionately so. The antero-posterior diameter at the level of the manubrium was relatively smaller than that at the level of the ensiform, and this was due to the tilting forwards of the sternum in its lower half. These two diameters were 1·5 and 4 cms. as compared with 2·5 and 4·5 cms. in the normal infant. The ribs lay more generally transverse than

they usually do, for the whole thorax was elevated. The thymus gland appeared to be normal in form and size; it was a little higher in the neck than is normal. A clear yellow-coloured fluid was found in the pericardial sac, lying anterior to and below the heart. The position of the pericardial effusion was due to the way in which the fœtus was placed during freezing. The heart corresponded in level to the first six dorsal vertebræ, instead of to the fourth, fifth, sixth, seventh, and eighth dorsal bodies, which is its usual position; it was therefore much displaced upwards. The valves and orifices of the heart were normal so far as could be judged, but the section had unfortunately passed through the foramen ovale. The ductus arteriosus was largely patent; the cardiac walls were, however, more anæmic in appearance than is usual. The lungs were unexpanded, lay posteriorly and laterally to the heart, and were surrounded by blood-stained pleural effusion. The apex of the right lung lay at the level of the sixth cervical vertebra, and its base extended no lower than the seventh dorsal; the left lung had very similar relationships. The trachea and œsophagus were normal, save for their relatively high position; and the thoracic duct was present.

The Region of the Abdomen.—The most remarkable pathological condition in this fœtus was the presence in the abdomen of a large quantity of transparent fluid of a light yellow colour, and containing no flakes of lymph; it occupied nearly the whole of the lower and anterior parts of the peritoneal cavity, and had evidently displaced the viscera upwards and backwards, and bulged the anterior abdominal wall forwards. The umbilical cord was attached at a point 2 cms. above the symphysis pubis and 9 cms. below the tip of the ensiform cartilage, and lay opposite to the body of the first sacral vertebra, being about one vertebral body lower than in the healthy infant. The umbilical arteries and veins and the urachus were normal. The liver, which was paler in colour than normal, and had like all the other viscera an anæmic appearance, was tilted upwards and forwards, especially in its anterior less fixed part. In vertical extent in the middle line the liver corresponded to the six lower dorsal vertebræ and to the first lumbar vertebra, instead of to the four lower dorsal and first two lumbar vertebræ, as in the normal infant. The whole liver was also rotated some-

what to the left side, and ascitic fluid intervened between the right and anterior hepatic surfaces and the anterior abdominal wall. The anterior surface of the liver was directed forwards and upwards instead of forwards only, and the left inferior surface looked less directly backwards and more in a downward direction than is normal. The gall-bladder contained some bile. The pyloric end of the stomach crossed the middle line at the level of the body of the twelfth dorsal vertebra, and was therefore one vertebra higher than is normal. The stomach contents were of a greenish colour and partly fluid; the organ lay entirely under cover of the left hepatic lobe. The spleen was somewhat enlarged; its greatest vertical measurement was 3 cms., and its greatest antero-posterior 3·3 cms. Its form, as seen on vertical section, was more quadrangular than is normal. The splenic enlargement was chiefly in the antero-posterior direction, but this increase was not altogether real; it was partly due to the displacement upwards of the lower end. The pancreas appeared normal in size and form, but was much infiltrated with fluid. Lying near the posterior abdominal wall, and under the left hepatic surface, were the closely packed together coils of the small intestine. Very little meconium was present in the bowel, and the coils were not glued together by lymph. The transverse colon was displaced backwards; the cæcum lay above its usual position on the right side; but the descending colon and sigmoid flexure pursued their usual course on the left side. The large intestine had a smaller calibre than is usual, and contained little or no meconium. The third part of the duodenum crossed the middle line at the level of the first lumbar vertebra. The supra-renal capsules were normal in size, but were anæmic in appearance. The kidneys were normal in position, but were slightly smaller than is the rule, and were not so distinctly lobulated as is usual at birth; they were also paler in colour than is usual. The mesenteric glands were present, and did not seem to be abnormally large.

The Region of the Pelvis.—The external genital organs were markedly œdematous; indeed, so great was the surrounding anasarca that the scrotum was embedded in it, and did not hang free as it normally does. The tunica vaginalis testis on both sides contained a quantity of serous fluid, and the urethra was not

occluded. The bony pelvis had its natural fœtal form. The bladder had an oval shape, the long axis of the oval passing upwards and forwards; it contained about 5 c. cms. of clear urine, which gave an indication of the presence of albumen when tested with alcohol. The rectum was collapsed, and contained little meconium; it was normal in form and position. A clear fluid was found in the pelvic cavity, both laterally and also in the middle line in the recto-vesical pouch.

The Limbs.—Save for the state of gelatinous anasarca of the subcutaneous tissue, and the anæmic appearance of the muscles, the limbs were normal.

II. *Microscopic Characters.*—In the case of this specimen the microscopic examination of the tissues was somewhat unsatisfactory, for the freezing of the infant had to some extent altered the characters of the parts; still, by comparing these appearances with those in other frozen infants, it was possible to some degree to correct this source of error, and to state what were the histological peculiarities of the viscera and skin.

A thin layer of epidermic cells was present, and underneath this both cutis vera and subcutaneous tissue had an opened-out appearance. There were fewer fat cells than usual, and both the subcutaneous and muscular tissue had a loose and spongy look. (Fig. 1.) The sections of the liver which were examined gave somewhat unsatisfactory results, for the tissue had evidently been altered both by freezing and by early post-mortem changes. The liver cells were imperfectly formed, and amongst them were many nucleated white cells; and whilst these latter were not, I think, so numerous as to constitute a lymphomatous state of the liver, still I have not seen so many leucocytes in the liver of a normal full-time infant. The same remarks apply to the microscopic examination of the spleen. The lungs, the intestines, mesentery, and the supra-renal capsules were, so far as could be made out, normal in structure, although there was a general anæmic appearance to be noted in them as in the other viscera. The kidneys also were, save for their bloodless condition, fairly normal. There were not, perhaps, so many uric acid infarcts as are present at the time of birth; and, in the opinion of one pathologist to whom I

showed the sections, there was an abnormally large amount of connective tissue in the left kidney, but I do not think that this

FIG. 1.—Section of Skin and Subcutaneous Tissue of Thigh of Fœtus with General Dropsy, Specimen A. *a*, œdematous cutis; *b*, groups of fat cells in subcutaneous tissue; *c*, musculature.

slight deviation from the normal could be supposed to be the cause of the general œdema. No pathological changes were detected in the umbilical cord or its vessels, save the unusually large amount of œdematous jelly of Wharton.

Morbid Anatomy of Specimen B.

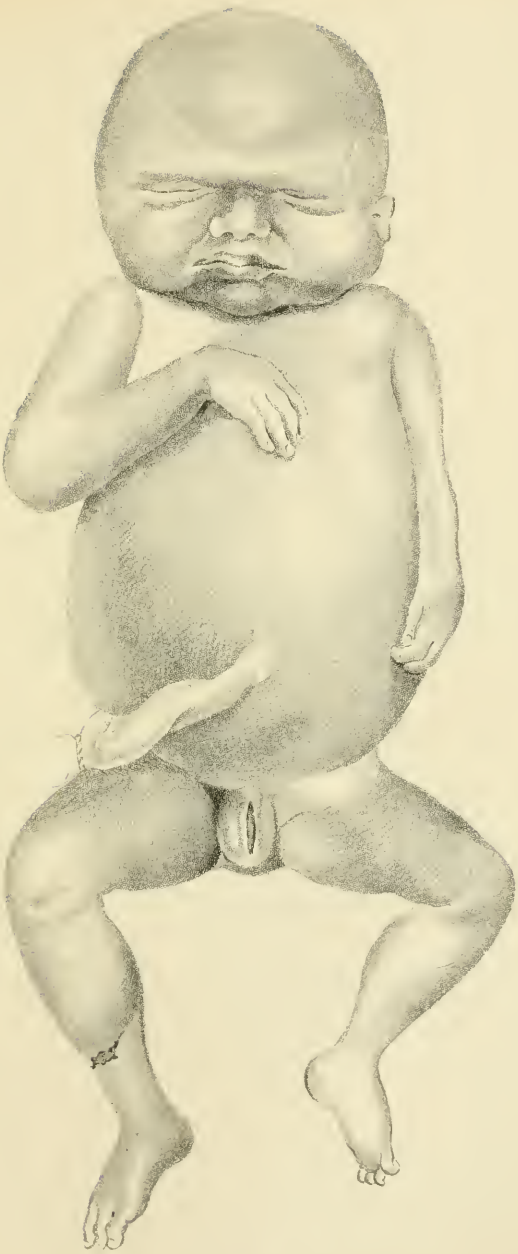
A. *External Appearances.*

As in the case of Specimen A, a water-colour sketch was made of this, the third dropsical fœtus to which Mrs A. gave birth (Plate IV.). In its external appearances it was, save in the matter of size and sex, an almost exact copy of Specimen A. There was the same anasarcous state of the integuments, the same swollen condition of the abdomen, and the same deepening of the normal grooves on the limbs and lines on the face. The skin had nearly everywhere a pinkish hue, but in some places it was pale yellow in colour. There was pitting on pressure all over the body, but this was specially marked on the head and legs. The right foot was seen to have been partly torn from the leg at the ankle,—a fact which demonstrated the friability of the tissues, for no great traction had been made upon the presenting part. The breech and right leg were more congested in appearance than the rest of the body, and this was accounted for by the circumstance that the presentation had been pelvic. The left labium minus was much swollen and congested.

The fœtus was a female, and weighed 1·3 kilogr. With the exception of the general œdema, there were no external malformations or deformities.

The *measurements* were as follows:—The total length was 35 cms., whilst from vertex to symphysis pubis it measured 23 cms. The head measured 28 cms. in the O.M. circumference, 26 cms. in the O.F., and 25 cms. in the s.O.B. The cranial diameters were—O.M., 10 cms.; O.F., 9 cms.; s.O.B., 8·5 cms.; Bi-P., 7 cms.; and Bi-T., 6·5 cms. The circumference of the thorax was 24·5 cms., and that of the abdomen 26·2 cms., whilst the transverse diameter of the former was 8·2 cms. and of the latter 10 cms. The circumference of the upper arm was 7·5 cms., of the forearm 5·8 cms., of the thigh 10·5 cms., and of the leg 8 cms. The two sides of the body were equally swollen from the œdema.

The Placenta and Membranes.—The placenta was strikingly similar to that in Case A. It had a very blanched appearance, quite unlike the normal afterbirth. The maternal surface was



General Dropsy of Fœtus, Case B (½ Nat. Size).

much broken up into lobules, and had a flocculent appearance. Threads of tissue were seen crossing over the sulci between the lobules. At one end of the placenta, not far from the aperture in the membranes, were two large hæmorrhages: one was about 3·5 cms. and the other about 4·2 cms. in thickness. These did not greatly resemble the usual placental hæmorrhagic infarcts, but it seemed rather as if the tissues were here bathed in blood and stained with it. These hæmorrhages had no doubt given rise to the bleeding during labour. The fœtal aspect of the placenta was also anæmic in appearance, and had a pale pinkish colour. The circumference of the placenta measured 53 cms.; it was not circular in outline, but had a length of 20 cms. and a breadth of 13 cms. At its thickest part it measured 4 cms. The umbilical cord was swollen, and had a more distinctly yellow colour than is normal. It was inserted eccentrically, being 4·2 cms. from the nearer, and 8 cms. from the more distant margin of the placenta. It was not near the hæmorrhagic part of the mass. The *membranes* seemed less transparent than usual, and on the outer surface of the chorion were numerous decidual fragments and pieces of blood-clot.

B. *Pathological Appearances of the Viscera, etc.*

I. *Naked-eye Appearances.*—The characters of the regions of the body and of the viscera may be described in the same order as in Case A. Since the differences between the appearances of the organs in Cases A and B are very slight, it will not be necessary to enter into full details in this instance.

Vertebral Column.—The spinal column and the contents of the canal were normal; there was no spina bifida, and no distension of the canal of the cord. The ossification was well advanced for the age of intra-uterine life. The spinal column measured 17 cms. in length. The promontory of the sacrum was faintly marked.

The Region of the Head.—There was well-marked gelatinous anasarca of the tissue lying between the scalp and pericranium, but there was no separation of the latter from the bone. The anterior fontanelle measured 3·4 cms. antero-posteriorly and 2·4 cms. in

a transverse direction. The ossification of the bones of both vault and base of the cranium was normal. The membranes of the brain were anæmic, but not otherwise pathological in appearance. The brain also was markedly anæmic. The cerebral convolutions and fissures were normal for the period of development arrived at; there was no distension of the ventricles; and the cranial nerves were regular in position and of the usual number. There was a small recent hæmorrhage on the under surface of the right temporo-sphenoidal lobe and in the tentorium cerebelli. The pituitary body was normal.

The Region of the Neck.—The parts in the cervical region (the larynx, pharynx, trachea, œsophagus, and thyroid gland) were well developed and normal in appearance, but were displaced slightly upwards.

The Region of the Thorax.—The thymus gland, which was paler in colour than usual, had a vertical measurement of 1·5 cms., a transverse of 1·8 cms., and an antero-posterior of ·8 cm. It was normal in form. The pericardial sac contained about 2 cubic cms. of a pale yellowish fluid. The heart had a vertical measurement of 3·2 cms., a transverse of 2·5 cms., and an antero-posterior of 1·8 cms. The chambers and orifices were normal, save that the foramen ovale was slightly less patent than is usual. The membrane seemed at first sight to close the aperture, but closer investigation showed that the closure was only apparent, and that there was really a free means of communication between the two auricles. The ductus arteriosus was patent. The cardiac muscular walls were anæmic in appearance. In the right pleural cavity were 10 cubic cms., and in the left about 2 cubic cms., of straw-coloured fluid. The lungs were markedly pale in colour. The greatest vertical measurement of the right lung was 4·5 cms., and that of the left was 4 cms. There was no abnormality in the form of these organs. The bloodvessels of the thorax were normal, and the thoracic duct was present in its usual position. There was one ossific centre in the sternum, and that was in the manubrium.

The Region of the Abdomen.—Before the abdominal cavity was cut open the fluid contents were drawn off for examination. The peritoneal sac contained 150 cubic cms. of a yellowish-brown fluid, slightly darker in colour than that in the pleural and pericardial

cavities. In this fluid the total proteids amounted to 0·087 (a very small proportion), and consisted chiefly of serum albumen, with a small amount of globulin. The fluid gave the colour reactions of bile-pigment, and on separation with plumbic acetate and rectified spirit gave with sulphuric acid a bright green pigment—biliverdin. Microscopically the fluid was found to contain endothelial cells and acicular crystals of bilirubin grouped together in stars. Dr Noël Paton was kind enough to examine the fluid for me.

When the abdomen was opened it was seen that the intestinal coils lay well above the brim of the pelvis, the cæcum and ascending colon lying at a higher level than is usual. On the left side, however, the descending colon was seen passing downwards and forming a sharp bend with the large sigmoid flexure, which lay across the pelvic brim and became continuous with the rectum. Such was the position of the intestines that on opening the abdomen the posterior abdominal wall was visible in its lower part, and the uterus, ovaries, and tubes could be clearly seen. In this instance, as in Case A., the bowels had evidently been displaced upwards and backwards, and the peritoneal fluid had occupied the lower and anterior part of the cavity.

The stomach measured 4·5 cms. in length, and contained a few drops of a pale green-coloured stringy mucus. The whole intestine measured a little over 150 cms. in length, and the colon and rectum were greatly distended with the dark green-coloured meconium. The small intestines were somewhat narrow in calibre, and contained little meconium; they had no great range of movement, not on account of any peritonitic adhesions, but from the small size of the mesentery. The vermiform appendix measured 2·5 cms. in length, and was normal in appearance. The liver was normal in form, and had the following dimensions:—Maximum transverse, 8·7 cms.; max. vertical, 5·7 cms.; and max. antero-posterior diameter, 3·8 cms. The hepatic tissue was paler in appearance than is normal. The spleen had its natural form, and measured 4·4 cms. vertically, 2·4 cms. antero-posteriorly, and 1·6 cms. transversely. It also had a somewhat pale and anæmic appearance, being less deeply purple than is usual. The kidneys were normal in position and form, and each measured 2·5 cms. vertically, 2 cms. transversely, and 1·3 cm. antero-posteriorly; they

were very pale in colour. The supra-renal capsules were in their natural fœtal position, and each measured 2·2 cms. vertically, 2·1 cms. transversely at the base, and 1·2 cm. antero-posteriorly. The pancreas was pale, but seemed otherwise normal. The bladder was empty; the hypogastric arteries and urachus were normal; but the ureters seemed slightly expanded in their calibre.

The Region of the Pelvis.—The external genital organs, especially the labia majora, were markedly œdematous; but the uterus, ovaries, and tubes had their normal fœtal characters.

The Extremities.—Save for the œdema of the subcutaneous tissue and the anæmic appearance of the muscles, the limbs were normal. The ossification was as far advanced as was to be expected at this age of fœtal life. There were no indications of syphilitic changes in the long bones, and there was no ossific nucleus in the lower end of the femur.

II. *Microscopic Appearances.*—The tissues were prepared for microscopic examination in two ways: the harder organs were cut in the freezing microtome, and the softer parts—placenta, spleen, thymus, etc.—were embedded in paraffin, and then cut and mounted. They were compared with similarly prepared organs from a normal fœtus.

The Skin.—Under the microscope it was seen that the network of the subcutaneous tissue had an opened-out appearance. The papillæ of the derma were not yet well marked. Many hair follicles and sebaceous glands in process of development were visible. A few non-sinuous sweat ducts were to be seen, and on the skin surface was the vernix caseosa. In the subcutaneous layer were many lymphoid cells, and these probably represented an early stage of the connective-tissue formation. The lobules of subcutaneous adipose tissue were not so numerous as in the skin of the full-time infant, but they were not abnormally few in number for the stage of fœtal life arrived at in this case.

The Muscles.—The striation of the muscle fibres was well marked. There were not many red blood corpuscles in the vessels between the muscle bundles, but an unusually large number of white cells was present.

The Lungs.—Only here and there in the pulmonary tissue was

a partially expanded alveolus; by far the greater part of the lung was atelectatic.

The *heart-muscle* and *thymus* gland revealed nothing abnormal in their structure, save a general anæmic state.

The Liver.—The lobular arrangement of hepatic cells round the central vein was masked by the presence of a very large number of white cells, which lay between the lobules and between the rows of liver cells. The bloodvessels had somewhat thin walls. The liver cells were not so regularly polygonal as usual. The capsule was normal. The organ was anæmic.

The Spleen.—There appeared to be no increase in the trabecular framework of the spleen, but there were great numbers of nucleated white corpuscles everywhere present. Red corpuscles in process of formation were also present, but in comparatively small amount.

The Kidneys.—There was marked anæmia of the renal tissue, but the glomeruli and tubules appeared normal. The supra-renal capsules were anæmic.

The Placenta.—The most marked changes in the placental structure were found in the villi, which were much larger than is usual in a six months' placenta. The increase in size seemed to be due chiefly to œdema, but in many of the villi there was also a greater amount of connective tissue than is normal. The epithelium covering the villi seemed normal,—perhaps slightly œdematous. The bloodvessels had a healthy appearance, but there were evident signs of anæmia throughout the whole placental tissue. The bloodvessels of the umbilical cord were normal.

CHAPTER XI.

GENERAL DROPSY OF THE FŒTUS—Continued.

CLINICAL HISTORY: MORBID ANATOMY, OF THE FŒTUS, OF THE PLACENTA AND UMBILICAL CORD.

In the preceding chapter the pathological anatomy, naked-eye and microscopic, of two specimens of general dropsy of the fœtus has been described, and clinical notes of these and of two other cases have been given. It is now necessary, before drawing any conclusions as to the origin and cause of this disease, to group together the results obtained by the various writers who have investigated this subject. Some sixty-five specimens have been described by about fifty-eight observers, whose names, together with the titles of their papers, will be found at the end of Chapter XII. In only a few cases have I been unable to consult the record in the original. In order to economize space the individual cases will be referred to by number. General dropsy as it occurs in the single, not in the twin, fœtus, is now under consideration.

Clinical History.

An analysis of the clinical details in the recorded cases brings out some interesting facts, but it must be borne in mind when estimating the value of these that in many instances such details were incomplete and in some entirely wanting. Among the questions in the clinical history which were specially investigated were the previous general and obstetrical history of the mother, and her state during the pregnancy and labour which terminated in the birth of a dropsical infant, the general history of the father, and any incidents in the family history which appeared to be of value.

A. Age of Mother.—In nearly every case in which the age was noted the mother was well advanced in her child-bearing life when

she gave birth to a dropsical infant. In seven cases only was the age less than 30,—20 years (69), 23 years (63), 24 years (56), 25 years (29), 28 years (29, 62), and 29 years (45); in all the others it was 30 or more,—30 years (15, 28, 40), 31 years (27), 32 years (58), 33 years (49, 55), 34 years (30), 35 years (34, 61), 36 years (35), 37 years (66), 42 years (17, 19, 67), 44 years (33).

B. Previous General Health, etc.—Prior to the pregnancy which terminated in the birth of a dropsical infant some mothers had enjoyed good health, whilst others had always been delicate or had suffered from serious illnesses, but the number of cases in which details upon these points were given was small. Those in which the previous general health was stated to have been good were Nos. 17, 19, 28, 40, 63, 66, 67, and 69; those in which it was noted that the mothers had had syphilis were Nos. 16, 39, and 47; and those in which there had been long-continued delicate or bad health were Nos. 27, 30, 34, 43, and 45. In one or two cases it was noted that the mother was of a phlegmatic and bilious temperament (7, 29), and in one she was alcoholic (21). Pulmonary complaints were mentioned in the records of Nos. 27, 40, and 42, and stomach troubles in No. 30.

C. Sexual History of Mother.—1. *Menstruation.*—In only a few cases was there any note of the menstrual type and habit of the mother. In No. 17 menstruation began at 15 and was always regular; in No. 27 the flow was at first regular, but afterwards became small in quantity and irregular (this may have been due to the pulmonary disorder); in No. 30 there were menstrual anomalies; in No. 45 the menses began at 15, were first regular, but became irregular later; in No. 64 they first appeared at 16, were regular but profuse (lasting eight days); and in my cases (Nos. 55 and 66) and in No. 67 the menstrual history was good.

2. *Previous Pregnancies and Labours.*—In several of the reported cases full details of the past pregnancies were given, *e.g.*, in Nos. 34, 37, 40, 43, 45, 49, 61, 64, and 67.

With regard to the *number of past pregnancies*, in only one of the recorded cases was the mother reported to be primiparous (No. 57); in all the others she was multiparous, and had usually had a large number of gestations. Thus, she was a ii.-para in Nos.

26, 29 (*b*), 62, and 63; a iii.-para in Nos. 27, 37, and 69; a iv.-para in Nos. 9, 19, 36 (*a*), 43, and 45; a v.-para in Nos. 29 (*a*) and 36 (*b*); a vi.-para in Nos. 33, 40, 58, and 61 (first of three dropsical infants); a vii.-para in Nos. 13, 28, and 35; an viii.-para in No. 61 (second dropsical infant); a ix.-para in Nos. 17, 34, 49, 55, 61 (third dropsical infant), and 67; and in my cases (Nos. 55 and 66), the ninth, tenth, and twelfth pregnancies ended in the birth of dropsical fœtuses.

In many cases no details of the *characters of the previous pregnancies* were given, but in some they were forthcoming. In No. 13 the six previous gestations had all ended prematurely; in No. 17, from the eight previous pregnancies had resulted seven healthy infants and one that had died of jaundice; in No. 19 the first had been a living infant, the second a dead one at the full term, and the third a dead one at the seventh month; in No. 27 the two previous gestations had produced two living but scrofulous children; in No. 29 (*b*) the preceding pregnancy had terminated prematurely; and in No. 30 the first gestation ended in the birth of a living healthy infant, and the second in twins that died at birth. In No. 31 there were first several healthy infants and then two dropsical in succession; and in No. 33 there were five earlier pregnancies, of which the fourth ended in the artificial delivery of a hydrocephalic fœtus accompanied by hydramnios and a large placenta. No. 34 had an interesting history. The first child was a healthy male, then came two miscarriages at the third month, then a healthy full-time female, then an abortion at the sixth week, a full-time female that was jaundiced and died in three days, then a still-born female at the twenty-sixth week, and finally a still-born male also at the twenty-sixth week. In No. 36 there were first two healthy infants and then three premature children at about the sixth month. In No. 37 the dropsical infant was preceded by a living healthy child and a dead-born premature one. In No. 40 the first child lived nineteen days, the second five and a half months, the third and fourth were still alive, and the fifth, a male, died in sixteen days. In No. 43 there was first a miscarriage and then two healthy infants, still alive. There were three previous pregnancies in No. 45, and all the infants died of convulsions, the first at the ninth month, the second at the sixth, and the third at the third. In No. 49 there

were first four normal gestations, then in the fifth version was necessary for a full-time dead infant, the sixth and seventh ended in the birth of dead infants, and the eighth came to a premature end with molar degeneration of the placenta. In Löhlein's cases, as reported by Fuhr (Nos. 58 and 64), the previous obstetrical record was interesting. The first child, a female, was weak, rickety, and scrofulous, and died of meningitis when four years old; the second, a female, born at the full term, died of fits at the sixth month; the third, a full-time male, died of general weakness; the fourth, a female, born at the thirty-sixth week, died in two days with ascites; and the fifth was a female born at the full term and still alive. In Cohn's case (No. 61) the first five pregnancies ended in abortions; the sixth at the eighth month in a dropsical infant with commencing maceration and a large dropsical placenta; the seventh in a normal living child; the eighth at the seventh month in a dead dropsical fœtus with œdema of placenta; the mother had œdema and dyspnœa in all her pregnancies, and suffered from chronic nephritis. In No. 63 there was one previous healthy infant; and in No. 67 there were eight full-time children, all of whom were alive, save one that died from long duration of labour. In No. 69 the first child was born at the full term and was healthy, whilst the second was expelled prematurely at the seventh month. The history in my cases has been already given; it resembled that in Nos. 34, 61, and 64.

3. *Present Pregnancy.*—In the majority of the cases some details of the pregnancy which ended in the birth of the dropsical fœtus were forthcoming.

As regards the *age of the gestation when labour set in*, it was found that in many cases the infant was prematurely born. The pregnancy terminated at the fourth month in No. 5; between the fourth and fifth months in No. 2; at the sixth month in Nos. 12, 36 (*a* and *b*), and 66 (*b*); at six and a half months in No. 34; during the seventh month in Nos. 16 (*a*), 19, 24, 27, 35, 39, 46, 49, and 57; during the eighth month in Nos. 3, 9, 10, 13, 17, 29 (*a* and *b*), 31 (*a*), 40, 47, 51, 56, 61, 63, and 66 (*a*); and at or near the full term in Nos. 4, 7, 8, 16 (*b*), 26, 28, 33, 37, 43, 45, 60, and 62. Labour was artificially induced at the sixth month in No. 69.

The *health of the mother during pregnancy* was seldom said to be

quite good. Usually she suffered from one ailment or another. *Maternal dropsy*, limited or widespread in area, was a comparatively common complication. Its presence was specially noted in Nos. 5, 13, 14, 27, 30, 33, 34, 40, 45, 47, 56, 61, 64, 67, 68, and 69; and its absence in Nos. 4, 7, 8, 9, 11, 12, 15, 16 (*b*), 17, 19, 21, 29 (*a* and *b*), 31, 35, 36, 37, 49, 63, and 66. The unusually great degree of *distension of the mother's abdomen* during the pregnancy was also a frequently noted symptom. This condition was in part due to the large size of the fœtus and placenta, but it was also produced by the hydramnios which so often was found as a concomitant state, *Hydramnios* was specially mentioned in Nos. 11, 12, 17, 27, 28, 29 (*a*), 31, 33, 34, 35, 37, 42, 49, 57, 61, 62, 64, and 66 (*a* and *b*). There was a slightly increased quantity of liquor amnii in No. 67. In a few cases there was not much amniotic fluid (Nos. 40, 43, 45, 56, and 69). In No. 69 the labour, indeed, was described as "dry." The great size of the mother's abdomen was also mentioned in some cases in which there was no note as to the presence or absence of hydramnios, as in Nos. 8 and 9, and in one in which the liquor amnii was small in amount (No. 45). *Albuminuria* was noted in certain cases, and in these instances it may be remarked that maternal dropsy was also a prominent symptom (Nos. 27, 34, 45, 56, 61, 64, 68, and 69). In No. 37, in which there was only a slight trace of albumen in the urine, there was no maternal œdema.

In one or two cases maternal *anæmia* was noted as a marked condition during pregnancy (Nos. 49, 66, and 67); in No. 40 there was a hydræmic or leukæmic state of the blood; and in none of these instances was there albuminuria, although in one (No. 67) there was localized œdema.

Hepatic derangements were noted in Nos. 27, 34, and 67; headache was specially mentioned in Nos. 7, 45, and 69; and pulmonary congestion and bronchial catarrh were present, in addition to other morbid states, in Nos. 26 and 27. In Nos. 15, 19, and 29 (*a* and *b*) a fall occurred during pregnancy, and in No. 15 the fall was followed by strangury and retention of urine. In one case (No. 54 *c*) the mother suffered from malaria, and in two (Nos. 30 and 64) she had heart disease. In Nos. 16 (*b*), 19, 39, and 47 there were signs of maternal syphilis during pregnancy, but in the great majority of cases it was especially stated that this disease was not present. In

one of the older cases (No. 4) it was noted that the mother had drunk copiously of beer, and she was alcoholic in No. 21. In No. 49 peritonitis existed during gestation, and proved fatal after delivery.

Very rarely was any mention made of *peculiarities in fœtal symptomatology* during pregnancy. Weakness of the fœtal movements was noted in No. 8; and in No. 27 the motions were never violent, and diminished in intensity and ultimately disappeared after a mental shock which the mother received. Feeble movements were also observed in Nos. 31 (*b*) and 57. In No. 17 there were no signs of life for twenty-four hours before delivery, and in a few other cases it was known that the infant was dead before labour set in.

4. *Characters of Confinement.*—In most cases more or less full details are given of the confinement, and in many instances the labour was tedious or instrumental.

Abnormal *presentations* were unusually common. The head presented naturally in Nos. 8, 13, 28, 29 (*b*), 31 (*a*), 33, 34, 35, 37, 43, 50, 56, 57, 61, 63, 64, and 69, and the presentation was probably normal in several cases in which no mention is made of the circumstance. The breech presented in Nos. 19, 40, 66 (*b*), and 67; and the feet in Nos. 17, 24, 27, 45, 51, and 68. In No. 24 there was also prolapse of the cord. In Nos. 29 (*a*), 30, and 49 there was a shoulder presentation, and in No. 47 the fœtal umbilicus was the part first felt at the os uteri. Out of thirty cases in which the presentation was noted, in thirteen it was preternatural. It must not, however, be concluded that the abnormal character of the presentation was due solely to the disease of the fœtus, for in twelve out of the thirteen cases in which some part other than the head presented there was the element of prematurity to be taken into account.

The labour was most commonly greatly delayed, but in Nos. 26 and 66 (*a*) the confinement was rapid. In several cases there was delay, but ultimately the difficulty was overcome by the unaided natural efforts (Nos. 24, 29 (*b*), 31 (*a* and *b*), 34, 35, 43, 45, and 56). Usually the head or a foot (according to the presentation) was expelled by the uterine force alone, but then great delay occurred, and the trunk remained firmly wedged in the pelvic canal. Some-

times the difficulty was overcome by making firm and prolonged traction upon the protruded part by the hands (as in Nos. 8, 28, 50, 64, and 66 (*b*)); or with a hook in the axilla or groin (as in Nos. 37 and 40). Sometimes the use of forceps was needed to extract the head (Nos. 13 and 61); and in other cases version was first employed to convert a transverse presentation into a footling (Nos. 10, 29 (*a*), 30, 47, and 49). In many cases, however, none of these measures was sufficient alone, and paracentesis abdominis fœtus was required in order to reduce the bulk of the infant and make it possible for it to pass through the pelvic canal (as in Nos. 17, 27, 33, 47, and 49). In some instances paracentesis abdominis did not suffice; the evisceration of thorax and abdomen and the separation of the head had to be effected before complete delivery took place in No. 63, and the detached head had to be craniotomised and extracted with the cranioclast in No. 67. In one instance (No. 13) accidental paracentesis abdominis occurred through tearing of the tissues of the anterior abdominal wall; this was followed by escape of the fluid and delivery. In a good many cases the birth of the infant was rendered still more difficult by the great friability of its tissues, as in Nos. 27, 33, 40, 49, 57, 63, 64, 66, 67, and 68. In No. 69 also, both the head and arm were torn off, and delivery effected by traction on the ribs. Finally, in one of the older cases (No. 15) the mother's bladder had to be punctured before the child could be born.

The third stage of labour was usually rendered somewhat difficult on account of the large size of the placenta; but this was not invariable (*e.g.* Nos. 31, 64, and 66). The after-birth had in several instances to be extracted manually, and sometimes in fragments, as in Nos. 17, 19, 29 (*a*), 40, 47, 49, 67, and 69. In one or two cases it was noted that there was considerable hæmorrhage both before and after the birth of the placenta (No. 34). The patient nearly died in No. 69.

5. *Characters of Puerperium.*—In by far the greater number of the cases the mother recovered quickly and completely from the effects of the pregnancy and labour, the puerperium being quite normal (Nos. 13, 17, 26, 27, 29 (*a* and *b*), 30, 31, 33, 34, 40, 45, 57, 61, 63, 64, and 66 (*a* and *b*)). In the cases in which maternal dropsy, albuminuria, or hepatic disorder had existed in pregnancy,

these morbid states rapidly disappeared after the birth of the child (Nos. 26, 30, 34, 45, 61, 64, and 69). In two or three cases only did death occur: from peritonitis in No. 49, from nephritis three weeks afterwards in No. 56, and from puerperal fever and vulvar diphtheria on the tenth day in No. 67.

6. *Later Obstetrical History.*—In very few of the recorded cases was there any note of the clinical history of the mother after the confinement which had terminated in the birth of a dropsical infant, but in one or two instances information bearing upon this very interesting question was forthcoming. In No. 29 a new pregnancy quickly followed the birth of the dropsical infant, and at the seventh month of this gestation the patient had an attack closely resembling that from which she had previously suffered and which had caused premature labour; she had the symptoms of peritonitis, but under treatment these passed off, and the woman was delivered at the full term of a healthy infant and a slightly diseased placenta. In No. 40 the mother afterwards gave birth to a normal child. In No. 57, in which three dropsical fœtuses had been born to the same woman, another pregnancy occurred in which there was neither maternal albuminuria nor dropsy, and this terminated at the third month in the expulsion of a macerated fœtus and a small placenta with a very thick decidua serotina. In No. 64 two pregnancies followed the birth of the dropsical infant: the first ended at the third month in the expulsion of an abortive ovum 5 cms. in diameter without any trace of a fœtus, but with a slight degree of molar degeneration; and the second had at the time of writing advanced normally to the sixth month.

D. Medical History of the Father.—Details of the medical history of the father are rarely found in the records of cases of fœtal disease, and this is specially true of those relating to cases of general dropsy. In No. 17, however, it was noted that the father had suffered from jaundice, and that during his wife's pregnancy he had died from dropsy and asthma. The father in No. 57 showed no signs of syphilis; and in No. 64 he was of alcoholic habits, but had not suffered from venereal disease or skin eruptions. In No. 63 there was found the note that there was no history of cancer on the father's side, and in No. 67 the remark that the father was free from syphilis. He had had no important illnesses in No. 69.

The state of the health of the father in my case (No. 66) has been already given.

E. Clinical History of the Infant.—The clinical history of the dropsical infant was always very imperfect, for it seldom survived its birth by more than a few hours. With regard to its *sex*, it was a male in Nos. 1, 2, 3, 5, 19, 24, 30, 31 (*a* and *b*), 34, 35, 54 (*b*), 63, 66 (*a*), 67, and 69; and a female in Nos. 4, 7, 40, 42, 43, 45, 54 (*c*), 56, 57, 64, and 66 (*b*). In the other cases the sex is not given. In some instances the infant was born alive and survived for a short time: for a few days in No. 4; for twelve hours in Nos. 11 and 16 (*a*); for ten hours in No. 28; for a few hours in Nos. 7, 8, 43, and 62; for one hour in Nos. 16 (*b*), and 24; and for a few minutes in Nos. 10 and 13. In other cases it was still-born and could not be resuscitated although the heart beat for some time (Nos. 26, 30, 31 (*a* and *b*), 34, 35, 40, 45, 47, and 66 (*a* and *b*)). Sometimes it was alive during labour, but died on account of the instrumental delivery, as in Nos. 17, 37, 49, 56, 57, 63, 64, 67, 68, and 69; and occasionally it had succumbed before the confinement (Nos. 19, 33, and 61). In yet another group of cases labour occurred before the fœtus had arrived at a viable age (Nos. 2, 5, 12, 36, and 66 (*b*)).

Pathology.

The morbid anatomy of the fœtus and placenta now fall to be considered, and in this relation it may be noted that whilst some writers have given very full descriptions of the diseased infant and its after-birth, others have contented themselves with recording scarcely more than the bare fact that a dropsical fœtus was born. The most valuable dissections are those recorded in Nos. 5, 16 (*a* and *b*), 17, 24, 30, 33, 34, 35, 37, 39, 41, 43, 45, 50, 51, 54 (*a*, *b*, and *c*), 56, 57, 60, 63, 64, 67, and 69.

A. Morbid Anatomy of the Fœtus.

I. *Macroscopic Characters.*

The *weight* and *measurements* of the fœtus were not often recorded; but when they were noted it was always found that they were larger than they ought to have been for the age of pregnancy

Fig. 1.

Fig. 2.

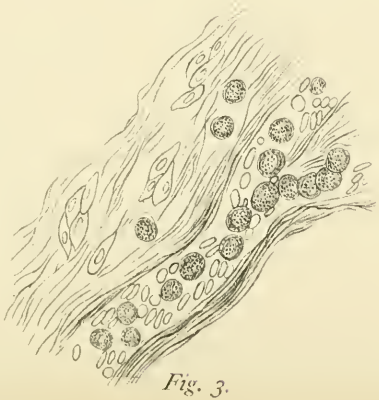


Fig. 3.

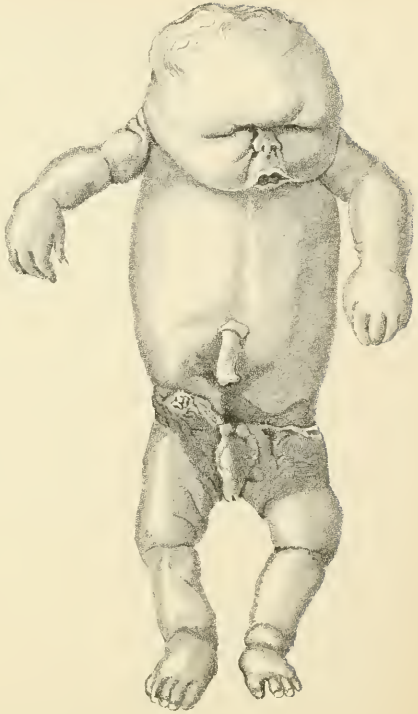


Fig. 4.

Plate V.

THIE LITH

DESCRIPTION OF PLATE V.

Fig. 1.—Sänger's specimen of General Fœtal Dropsy (congenital leukæmia), about $\frac{1}{4}$ natural size.

Fig. 2.—Lymphoma of Liver in Sänger's specimen, microscopic appearances.

Fig. 3.—Placenta in Sänger's case; microscopic appearances showing œdematous tissue of a villus, branching vessel packed with leucocytes, also three free leucocytes.

Fig. 4.—Raineri's specimen of General Fœtal Dropsy, about $\frac{1}{4}$ natural size.

arrived at. In length, the fœtus measured four fingers in No. 1; six inches in No. 5; more than an ell in No. 9; 15 inches in No. 30; 41 cms. in No. 40; 42·8 cms. in No. 43; 49 cms. in No. 45; 46 cms. in No. 49; 41 cms. in No. 56; 51 cms. in No. 64; 43 cms. and 35 cms. in No. 66 (*a* and *b*); and 44·5 cms. in No. 67. The weight of the infant was from 16 to 17 lbs. (French) in No. 8; about 3 lbs. in No. 10; 2950 grammes in No. 40; 3180 grammes in No. 45; 3100 grammes in No. 49; 2200 grammes in No. 56; 3320, 2900, and 3100 grammes in No. 61; 3490 grammes in No. 63; 3810 grammes in No. 64; 1300 grammes in No. 66 (*b*); 3000 grammes (without fluid and cranial contents) in No. 67; and 1150 grammes in No. 69.

In some eleven cases more detailed external measurements of the dropsical infants were given (Nos. 24, 43, 45, 54 (*a*, *b*, and *c*), 56, 64, 66 (*a* and *b*), and 67). In No. 24 it was stated that the circumference of the abdomen was about 42 cms., and the distance from the ensiform cartilage to the symphysis was 22 cms.; in No. 43 that of the head was 33 cms.; in No. 45 the cranial circumference was 36·5 cms., the O.M. diameter 14·5 cms., and the O.F. 10 cms.; in the three fœtuses described by Hönck (No. 54) the thoracic diameters were given; in No. 56 the large cranial circumference was 34 cms., that of the abdomen 36 cms., whilst the measurements of the limbs showed that those of the right side were markedly greater than those of the left side; in No. 64 the head circumference was 33 cms., the O.M. diameter 12 cms., the s.O.B. 9 cms., the Bi-P. 9 cms., the Bi-T. 8½ cms., the circumference of the shoulders 37 cms., and of the abdomen 51 cms., etc.; the measurements in No. 66 (*a* and *b*) are recorded elsewhere; and in No. 67 the diameters of the head, shoulders, etc., were greater than is usual at the eighth month of pregnancy.

A *general dropsical state of the subcutaneous tissue* was the most evident and most constant macroscopic condition found in this disease of the fœtus. It was noted in all the cases (Nos. 1 to 67), and it is well shown in Plates I., II., III., IV., and V. (Figs. 1 and 4). The specimens were variously described as universally dropsical; generally, very, or altogether œdematous; extremely or universally anasarcous, etc. It was sometimes stated that certain parts of the body were specially dropsical, as the scalp (Nos. 2, 17, 30, 31, 34,

and 61), the face (Nos. 19, 28, 35, and 67), the limbs (Nos. 13, 19, 26, 37, and 61), the abdomen (No. 24), and the scrotum (No. 31). Usually the subcutaneous effusion was described as serous in character, sometimes as resembling partly congealed gelatin (Nos. 5, 66, 68, and 69), and sometimes as sanguinolent (Nos. 16 and 36). The fact that pressure caused deep pitting of the surface of the body was often noted, as was the oozing of a serous fluid from superficial cuts and tears of the integument. In some cases the great hardness of the skin was described, and in one case it was said that so tense was the integument that the limbs could not be bent without tears occurring. In one case (No. 30) it was said that the serous fluid contained albumen but no sugar; and in another (No. 45) the skin was described as much thickened and in a state like elephantiasis. So great was the œdema in some cases as to cause positive deformity (Nos. 30, 35, 43, and 67). Numerous subcutaneous ecchymoses existed in No. 39. In a few instances the anasarca was accompanied by the presence of vesicles or blebs on the skin-surface (Nos. 19, 33, and 64). The existence of a cephalhæmatoma was noted in Nos. 41, 54 (*a*), and 66 (*a*), and there was some intra-cranial hæmorrhage in Nos. 45, 54 (*c*), and 66 (*b*). There was a blood extravasation under the skin of the left side of the abdomen in No. 24. With regard to the colour of the skin, it was usually described as dusky red, livid, coppery, or pink. In my cases (No. 66, *a* and *b*) it was dark pink, with patches that had a glossy yellow appearance.

Another frequently noticed character of this disease was great *friability of the tissues*, especially of the subcutaneous, but also of the muscular and osseous. So marked was this in some cases (Nos. 47 and 57) that the authors named it in the general title of their papers. The friability of the parts was usually discovered during the extraction of the fœtus, when in several cases the tissues of the neck gave way (Nos. 33, 40, 56, 63, 64, 67, 68, and 69). In one instance (No. 13) tearing of the anterior abdominal wall took place; in another (No. 47) the lower jaw was torn off; in others (Nos. 33, 47, 49, 57, 63, 66 (*b*), and 67) the limbs gave way; and in many cases the skin was lacerated in various places. The friable character of the tissues was probably due to their sodden condition;

for the skin, subcutaneous, muscular, and fascial structures were all infiltrated with serum. It will be seen later that usually the placenta and umbilical cord were also œdematous and easily torn.

In the great majority of the reported cases the presence of *fluid in the pleural, pericardial, and peritoneal cavities* was noted. In only one or two instances was the state of the serous cavities not mentioned (Nos. 51, 54 (*b* and *c*), and 60). The presence of fluid in the abdominal cavity was a very constant feature, and the effusion was described as clear, straw-yellow, light yellow, brownish yellow, olive-green, clear green, citron coloured, or brownish in colour; and transparent in character. Sometimes (Nos. 24, 34, 36, and 56) it was noted that there were flakes of lymph floating in the fluid. Occasionally the remark was made that the effusion was albuminous (Nos. 30, 35, and 37); and in one of my cases the proportion of proteids was very small, and there was bile-pigment present (No. 66, *b*). In several specimens there was serous effusion in the pleural sacs as well as in the peritoneal (Nos. 3, 15, 16 (*a* and *b*), 19, 20 (*a* and *b*), 21, 22, 28, 34, 35, 36, 41, 43, 45, 46, 50, 54, 56, 57, 62, 64, and 66); and the fluid was clear yellow serum. In many instances there was also hydropericardium (Nos. 16 (*b*), 19, 20 (*b*), 21, 24, 28, 30, 34, 35, 36, 41, 43, 46, 50, 54 (*a*), 56, 57, 62, and 66). In one or two cases there was hydrocele (Nos. 19, 31, 35, and 66 *a*); and in a small number of specimens, hydrocephalus often only slight (Nos. 22, 24, 30, 33, 45, and 50). In Nos. 50 and 64 there was also spina bifida. The quantity of fluid in the abdomen was occasionally given: three pints (Paris) in No. 8; two pounds in No. 24; 500 grammes in No. 49; 450 grammes in No. 56; 200 cub. cms. in No. 64; and 150 cub. cms. in No. 66 (*b*). There were 100 cub. cms. of fluid in the thorax in No. 64, and 12 cub. cms. in No. 66 (*b*).

The complete dissection of the dropsical fœtus was not always made; but in the more recently reported cases a thorough post-mortem was usually carried out.

The *appearances presented by the viscera* were far from being uniform, indeed they varied within wide limits. Perhaps the most frequently recorded character was a general bloodlessness of the organs; this was noted with regard to some or all of the

viscera in Nos. 5, 14, 16 (*a*), 41, 56, 57, 66 (*a* and *b*), and 67. The *brain* was in some cases found to be pale, in others congested, and the same statement was true of the cerebral membranes; but in a large proportion of cases these structures were not described. In Nos. 5, 16 (*a*), and 56, the brain was pale; in Nos. 16 (*b*), 20 (*b*), and 30 it was congested; in Nos. 24, 33, 41, and 63 the cerebral or spinal membranes were œdematous, and there was œdema cerebri in No. 39; and in Nos. 24, 56, 57, 63, and 64 there were meningeal hæmorrhages.

The *heart* was stated in some instances to be normal (Nos. 20 (*b*), 34, 37, 39, 45, 56, 57, 64, 66, and 69); in other cases it was pale and anæmic; but in a small group of specimens it was the seat of disease or malformation (Nos. 30, 35, 43, and 60). In No. 30 there was transposition of the cardiac vessels, along with a defect in the septum of the ventricles, narrowing of the pulmonary orifice, and the signs of fœtal endocarditis; in No. 35 there was a closed condition of the foramen ovale, whilst the ductus arteriosus was widely patent, and the same condition was found in No. 60; and in No. 43 there was persistence and stenosis of the truncus arteriosus communis, and defect in the septum of the ventricles (*cor triloculare biatriatum*). In one or two cases the displacement of the heart by the distension of the abdomen was noted (Nos. 24 and 66); and in some instances cardiac hypertrophy was described—of the right ventricle in No. 54 (*b* and *c*), and of the left in No. 63. A thin-walled condition of the large blood-vessels was mentioned in Nos. 30, 41, 56, and 66.

The *lungs* were nearly always described as unexpanded or imperfectly distended. They were said to be healthy in Nos. 16 (*b*), 28, 34, etc.; œdematous in Nos. 5 and 20 (*b*); pneumonic in No. 20 (*a*); pale and very dense in No. 30; and solid in No. 62. There was cystic dropsy of the right lung in No. 45.

The *thymus* gland was not often referred to; but in one or two cases it was described as pale and anæmic, and in No. 30 it was said to be imperfectly developed. It was normal in No. 24.

A diaphragmatic hernia leading to compression of the vena cava inferior was noted in No. 50, and a spurious left-sided one existed in No. 64.

Signs of *peritonitis* were found in Nos. 19, 20 (*b*), 24, 28, 30, and

46; but in several cases it was stated that there was no evidence of this disease.

The *liver* had no constant appearances. It was small in Nos. 16 (*a*), 30, 34, and 43; larger than normal in Nos. 17, 20 (*b*), 31, 41, and 69; anæmic in Nos. 5 and 36; congested in No. 45; soft and friable in Nos. 17, 31, 34, and 36; firm, contracted, or cirrhotic in Nos. 30, 43, and 56; and it had a small third lobe on the left side in No. 64. The liver, like the other abdominal viscera, was transposed in No. 30; and it showed fatty degeneration at some points in No. 57.

The *spleen* also varied in the appearances which it presented. In some cases it was large (Nos. 19, 20 (*b*), 31, 39, 41, 43, and 56); in No. 30 it was relatively small; it was congested in No. 45, and friable in No. 31; and it was firmer in consistence than normal in Nos. 30 and 43. Its tunica propria was whitish from imbibition of serum in No. 24. Enlargement of the mesenteric glands was mentioned in No. 19. The *intestines* were usually described as small and contracted with a short mesentery (Nos. 17, 30, 31, 34, 41, 45, 56, 63, and 66); they contained but a small quantity of meconium, and occupied only a small part of the abdominal cavity. The *pancreas* was rarely mentioned, once or twice it was described as pale and anæmic (No. 56), twice as small and denser in consistence than normal (Nos. 30 and 39), and once as studded with purpuric spots. It was transposed like the other viscera in No. 30.

From an etiological point of view the state of *the kidneys* ranked next in importance to that of the heart. In some cases the renal organs appeared normal to the naked eye (Nos. 24, 34, 41, 64, and 66); in one instance they were said to be small, soft, and pale (No. 56); in No. 30 they were finely granular, and of greater density than normal; and in Nos. 54 (*b*) and 63 they were the seat of complete cystic degeneration and were greatly enlarged. In No. 63 the renal vessels were very small and atrophied, and in No. 57 the left ureter was dilated. In No. 69 the kidneys and adrenals were enlarged.

The *bladder* was usually described as healthy, sometimes as pale, and sometimes as containing a little non-albuminous urine. A structure supposed to be a remnant of the primitive kidneys was described in No. 43.

There was a uterus septus with vagina duplex in No. 54 (*c*), and in No. 30 there was an undescended testicle on the left side; but in the other specimens the *genital organs* were probably normal. It was sometimes stated that the *muscles* were pale and bloodless (Nos. 30, 56, 66, and 69); but in other instances there were numerous purpuric spots in their substance (No. 16 *a* and *b*). It was in a few cases noted that the *bones* were soft and easily broken (Nos. 30 and 57); in No. 57 also there was pseudo-anchylosis of the scapulo-humeral and coxo-femoral joints; in No. 64 there was talipes varus; and in No. 67 a condition like talipes equinus. Curvature of the spine was described in No. 54 (*a* and *c*). The limbs were rigid and flexed in No. 62.

II. *Microscopic Characters.*

In only nine cases was there any record of a microscopical examination of the tissues of the diseased fœtus (Nos. 34, 39, 41, 56, 63, 66 (*a* and *b*), 67, and 69). In No. 34 the liver was examined, and it was found that there were no well-formed hepatic cells, although the nuclei were present in abundance. In No. 39 there was a syphilitic sclerosis of the arteries of the skin, muscles, liver, and kidneys; their lumen was much diminished, the intima was normal, the muscularis hypertrophied, and the adventitia thickened. There existed also pancreatitis chronica, commencing interstitial hepatitis, hæmorrhagic and small-celled infiltration of the interstitial renal substance, and blood tube-casts. The microscopical examination of Jakesch's specimen by Klebs and Eppinger (Nos. 40 and 41) revealed a leukæmoid, if not perfectly leukæmic condition. The kidneys showed a large quantity of lymphoid elements lying between the uriniferous ducts and Müller's capsules, whilst the ducts themselves were normal; the cords of the splenic pulp contained lymphoid cells in such number as to appear as if composed of them; in the liver there was an aggregation of similar cells in the interspaces; and there was the same engorgement with lymphoid elements in the lungs, in the transversely striped muscles, and in the skin. In Mattersdorf's specimen the liver and kidneys showed similar changes. In Sänger's specimen (No. 56, Plate V., Fig. 2) there was also congenital leukæmia. The peritoneal fluid contained numerous

large leucocytes as well as red cells and peritoneal endothelium; the white corpuscles of the blood were increased in number, so that there was one white to three red cells; the splenic pulp consisted almost entirely of leucocytes, most of them with large nuclei and several nucleoli; the liver was crowded with white cells grouped in masses, so that in each acinus there were several of these lymphomata radially arranged round the central vein, and in some places they were nearly as numerous as the liver cells themselves; and, finally, the marrow of the bones was made up almost entirely of leucocytes. Sänger considers Jakesch's specimen and his own as examples of congenital splenic or spleno-myelogenous leukæmia. Similar microscopic appearances were presented by my two specimens (No. 66 *a* and *b*); but the lymphoid infiltration was not so great as that described by Klebs and Eppinger, and Sänger. In No. 67 the renal tissue showed a diffuse infiltration with white cells, most marked in the medullary portion of the organ. So intense was this at the apices of the papillæ that one could scarcely recognise the structure of the tubes of Bellini, the epithelium of which was desquamated, or destroyed, or devoid of nuclei; but in the cortex the infiltration was limited to small groups of tubules and glomeruli, and the epithelium was well preserved. The white cells were leucocytes, some polynucleated, others with one large nucleus. A similar condition was met with in the liver: the hepatic capillaries were crammed with white cells; the liver cells had a very granular protoplasm, and some were atrophic and without nuclei. There was nothing of interest in the spleen. The osseous tissue was normal, and there were nowhere any traces of micro-organisms. In No. 63 the microscopical examination of the cystic kidneys was given. The small cysts lay in a stroma of mucous connective tissue richly vascularized; some of them were formed from the excretory tubules, others from the capsules of the glomeruli; and the epithelium which lined them was a single layer of flat cells.

B. Morbid Anatomy of the Placenta and Umbilical Cord.

I. *Naked-eye Characters.*

The macroscopic characters of the placenta were very much the

same in all the cases in which they were described. In each one its large size was noted; it was said to be three times as large as normal in Nos. 33 and 40, and was described by the writer in No. 37 as the largest he had ever seen; it weighed more than 3 lbs. in No. 17, $3\frac{1}{2}$ lbs. in No. 37, 1920 grammes in No. 49, 900 grammes (but more immediately after expulsion) in No. 56, 2900 grammes in No. 61, 1075 grammes in No. 63, 1100 grammes in No. 64, 1200 grammes in No. 67, and more than 1240 grammes in No. 69; its thickness was stated to be $2\frac{1}{4}$ inches in No. 29 (*a*), 3 cms. in Nos. 64 and 67, and 5 cms. and 4 cms. in No. 66 (*a* and *b*); and its diameters were 21 by 18 cms. in No. 64, 19 by 17 in No. 66 (*a*), 20 by 13 in No. 66 (*b*), and 27 by 23 in No. 67.

The placenta was described as soft in consistence, œdematous, and easily torn in the majority of the cases (Nos. 17, 27, 33, 34, 35, 37, 40, 45, 46, 49, 51, 56, 61, 63, 64, 66 (*a* and *b*), 67, and 69). In No. 29 (*a* and *b*), however, there was no serous effusion into the placenta, which was perhaps due to the fact that the infants were dead before birth; there was thickening and softness of the parenchyma. In No. 30 there was an unequal development of the placental lobes, and there were numerous apoplectic infarcts or placental thromboses, some recent, some old; but in most of the other cases hæmorrhages into the after-birth were not described. In a few instances (Nos. 31 (*b*) 57 and 68) the placenta was said to be normal to the naked eye. In many cases the anæmic appearance was also referred to; and in No. 40 Jackesch, with what he himself termed a somewhat daring freedom of imagination, compared the birth of the placenta to the slow rolling forth of wool from an over-filled torn woolsack. In several instances the broken up character of the after-birth was noted (Nos. 17, 30, 33, 37, 40, 45, 47, and 66).

The appearances of the umbilical cord were not often stated, but when they were given they were found to be very similar in all the cases. The cord was usually thick and œdematous, often friable (Nos. 17, 47, 57, 63, and 66), and sometimes inserted into the placenta near one side of that organ. No abnormality of the vessels of the cord was mentioned in any of the cases of dropsy of the single fœtus.

In one instance it was stated that the chorion and amnion were

thickened (No. 30); in No. 64 they were described as normal; but in no other case was there any allusion to their characters.

II. *Microscopic Characters.*

In only six cases was there any description given of the microscopical structure of the placenta (Nos. 34, 51, 56, 66, 67, and 69). In No. 34 the placental tufts were thin and badly grown, and the epithelium at their extremities was ill defined and insufficiently developed; in No. 51 the villi were changed in form from increase in size, and there was hyperplasia of the epithelium, the stroma, and the vessels; in No. 56 there was unusual swelling of the connective tissue of the villi, their epithelium was mostly lost, and their capillaries contained leucocytes in the same disproportionately large amount as in the fœtal blood; and in No. 66 (*b*) there was swelling of the villi, increase in their stroma, and some degree of œdema of their epithelial covering. In No. 69 there were irregular spaces in the stroma of the villi. In No. 67 it is stated that no micro-organisms were present in the placenta.

CHAPTER XII.

GENERAL DROPSY OF THE FŒTUS—Continued.

ETIOLOGY AND PATHOGENESIS; DIAGNOSIS; PROGNOSIS; TREATMENT; LITERATURE.

Etiology and Pathogenesis.

It is now possible to approach the difficult question of the nature and cause of general dropsy of the fœtus with some hope of throwing a little light thereupon, for in the preceding pages have been recorded the facts that have been discovered bearing upon the subject. This disease, however, in common with all fœtal maladies, presents very special difficulties to the investigator; for comparatively little is yet known with regard to the effect of maternal, and to some extent of paternal, morbid states upon the health and development of the fœtus. It is necessary, therefore, in the present state of our knowledge to be content with imperfect and partly theoretical explanations of the pathogenesis and etiology of general dropsy of the fœtus.

Of the writers who have described cases of this disease some have attempted no explanation whatever of its cause; but many have discussed the matter more or less fully, and have suggested solutions of the problem which are more or less probable. Investigators have looked in three directions for the cause of general fœtal dropsy. Some have sought for its origin in some morbid state of the mother's health during pregnancy; others, in some pathological condition of the father transmitted to the ovum directly through the spermatozoon at the time of fecundation; and yet others, in some purely fœtal disturbance. Several later writers, recognising the difficulty of ascribing the cause either to a maternal or to a fœtal state, have supposed that both the mother and the fœtus must show pathological conditions in order to produce general dropsy in the latter.

Some writers, it has been stated, have attempted no explanation of the origin of general dropsy; but it must also be noted that some have looked closely for a cause and found none. Thus Weber (No. 24), although he was able to exclude inflammatory fœtal processes, could find no anatomical cause for the dropsy; in Burton's cases (No. 31, *a* and *b*), in which the fœtus and placenta were carefully examined by Dr Wilks, no explanation was forthcoming; and in Hönck's first case (No. 54 *a*) the pathogenesis was left quite obscure.

The theories of the writers who looked to maternal conditions alone for an explanation of the disease must now be considered. Seeger (No. 4) would seem to connect the origin of the fœtal state with certain circumstances which occurred near the close of the pregnancy. These were, the mother's fright at the breaking out of fire in a neighbouring house, and the fact that she partook of a copious draught of beer! Billard (No. 15) saw an intimate relation between the strangury and retention of urine in the mother (following a fall) and the dropsy in the fœtus; but he attempted no explanation of the *modus operandi*. Montgomery (No. 21) would seem to hint that the alcoholic habits of the mother had something to do with the production of the fœtal disease. Several older writers (Nos. 5, 6, 13, and 14), noting that the mother of a dropsical infant was also in some instances dropsical, seem to have looked upon the disease as transmitted from the former to the latter. This was a view quite in keeping with the pathology of the time, which looked upon several fœtal diseases—*e.g.*, jaundice, ague, epilepsy, dropsy, etc.—as passing directly from mother to fœtus. Graetzer (No. 18) showed that it was very difficult to accept this theory, by pointing out that many dropsical mothers gave birth to healthy infants, and that dropsical infants were sometimes borne by healthy mothers. The question of the relationship of maternal to fœtal dropsy must, however, be considered again, when the influence of maternal nephritis is under discussion.

Clay (No. 29) opened up the subject of the relationship of the placental condition to the fœtal dropsy. As regarded his first case, he looked upon the anasarca as not due to the state of the placenta (which he regarded as inflammatory), but as produced by the condition of the mother's blood, which in its turn was probably con-

nected with her cachectic state. The anasarca of the fœtus in his second case he ascribed to the hypertrophic character of the placenta; but with regard to both cases he concluded that, although the dropsy arose from different causes, it probably depended upon a poison in the blood of the mother, or upon some other peculiarity in that fluid. Ritter (No. 33) went a stage further, and defined the peculiarity of the maternal blood: he ascribed the fœtal dropsy to hydræmia of the mother. Protheroe Smith (No. 34) found the cause of the maternal albuminuria, anasarca, and jaundice which existed in his case, in hyperæmia; and asked whether the same general derangement of the mother might not have been also the causal factor in the production of the fœtal disease. Williams, in the discussion which followed the reading of Bassett's case (No. 37), suggested that the fœtal dropsy might be due to some interference with the renal functions of the placenta which caused the blood of the fœtus to become like that in Bright's disease. Bassett himself looked upon overgrowth of the placenta as the starting-point of departure from health, and upon the dropsy as a sequence to this. Snow Beck (No. 36) suggested as an alternative cause some condition of the mother's health causing defect or deficiency in the blood supplied to the placenta. Ahlfeld (No. 49) seems to have thought that the anæmia of the mother, accompanied by an increase in the number of the white corpuscles in her blood, had something to do with the dropsy of the fœtus. Ruge (No. 51) found no fœtal cause for the dropsy, and was driven to suggest consanguinity of the parents as a possible explanation. Cruveilhier and Simpson (Nos. 16 and 19), although they made no definite statement upon the question, probably regarded maternal syphilis as the cause.

The theory that fœtal dropsy is due solely to maternal nephritis now requires notice. Strauch (No. 45) strongly advocated this view. In his case he was able to exclude syphilis of the parents and leukæmia of the fœtus, and was thrown back upon the nephritis of the mother for an explanation of the general dropsy of the infant. His chain of reasoning was as follows:—The mother had a contracted kidney, and in consequence increased arterial tension and venous stasis. There was, therefore, increased pressure in the maternal portion of the placenta, and an exudation of serum into

the intervillous spaces (for he accepted Klebs' theory of the existence of lymph spaces surrounding the villi); this exudation was also predisposed to by the hydræmic character of the maternal blood due to the renal disease; the placenta being the place of least resistance, œdema occurred there, although not in the other maternal organs; and the blood coming from the fœtus in the umbilical arteries met with resistance in the placenta, which caused increased venous pressure and œdema in the fœtus. Strauch also considered that it was probable that the diminished flow of nourishing blood to the fœtus from the placenta, and possibly the transmission to it of hydræmic blood from the mother, might be two further causal influences in the production of the dropsy. Cohn (No. 61), in his paper on the influence of pregnancy-nephritis on the fœtus, reported one case in which a woman gave birth to three dropsical fœtuses in successive gestations; but he did not attempt to explain the connexion between the maternal and fœtal states.

Only one or two writers have sought for an explanation of the origin of fœtal dropsy in paternal morbid states, and they have contented themselves by putting the supposition interrogatively. Thus, Seulen (No. 17) asked whether the fact that the father suffered from dropsy, which proved fatal, could be supposed to have caused the dropsy of the infant, and Goldmann (No. 27) put the same question. The case of the brother of the mother of my two specimens may also be quoted in this connexion, for he was the father of a dropsical infant, his wife remaining all the time quite healthy.

A purely fœtal cause was often sought for, but only occasionally found, by investigators. Abnormal conditions of the heart were found in some instances, and were looked upon as causal. Thus, Lawson Tait noted in his specimen (No. 35) the absence of direct communication between the auricles of the heart of the fœtus due to premature closure of the foramen ovale, and to this he ascribed the dropsy of the fœtus and placenta and the hydramnios. The closure was not complete, for there was a crescentic valvular opening, 1-12th of an inch in size. The ductus arteriosus was widely patent. Pott found that the heart of the dropsical fœtus (No. 43) was three chambered (there were two auricles, but the ventricular septum was defective); that there was persistence of

the truncus communis arteriosus, and that valvular stenosis of the ostium arteriosum existed. He argued that the stenosis of the ostium arteriosum caused lowering of the arterial pressure in the fœtus, that the heart attempted to overcome this, and that dilatation and hypertrophy of the ventricle and of the right auricle followed, but were insufficient; and that, in consequence of this failure, effusion of serum into the fœtal tissues took place. Congestion and subsequent cirrhosis of the liver were due to the same cause, and led to the fœtal ascites. Osler (No. 60) found a heart condition very similar to that in No. 35. There was a nearly impervious foramen ovale (a valvular orifice 8 millimetres in length existed) and a very large ductus arteriosus. Osler had, however, to confess that the connexion between the dropsy of the fœtus and the heart anomaly was not very clear.

In Behm's case (No. 50) the fœtus showed several malformations besides the dropsy, and amongst these was diaphragmatic hernia. The writer ascribed the dropsy to the hernia, stating that the drag of the viscera in the pleural cavity compressed and obstructed the vena cava inferior.

In Hönck's second specimen (No. 54 *b*) there was cystic degeneration of the fœtal kidneys. There was, therefore, he argued, an almost completely impervious state of the vessels, and this caused great obstruction to the circulation and consequent escape of serum. Large cystic kidneys existed also in Gueniot's specimen (No. 63).

Other conditions obstructing the fœtal circulation were sometimes found. Thus Schütz (No. 39) discovered in the case of a syphilitic fœtus affected with general dropsy that there was arterial sclerosis of the vessels of the subcutaneous tissue, and to a less degree of those of the kidneys and liver. The lumen of the arteries was considerably diminished, and the walls greatly thickened. Raineri (No. 67) considered that the œdema of the fœtus and placenta might not unreasonably be ascribed to the hindrance of the hepatic circulation and the obstruction to the renal secretion caused by the infiltration of these organs with leucocytes. The state of the liver he regarded as closely similar to the congenital interstitial hepatitis of syphilitic infants.

Abnormal conditions of the fœtal blood have been thought by

some to be the causes of the general dropsy. In Jakesch's case, investigated by Klebs and Eppinger (Nos. 40 and 41), "a leukæmoid, if not perfectly leukæmic" state of the fœtus was discovered along with thin-walled veins. Klebs stated that since dropsical phenomena were not rarely met with in leukæmia in adults, they might also be looked for in the fœtus, and indeed were more likely to occur in the latter, because of the surrounding liquor amnii, which prevented the giving-off of water by the skin and lungs. He looked upon the leukæmia and the thin-walled state of the vessels as the causes of the dropsy of the infant. With regard to the placenta, he regarded the chorionic villi as free from the dropsy, which he placed in the so-called intervillous lymph spaces. In order to make this theory tenable, it was necessary to cast aside the generally accepted view of the structure of the placenta, which regarded these spaces as blood sinuses.

The etiological theories of those authors who looked for the cause both in the mother and in the fœtus must now be noted. Virchow (No. 30) worked out very fully the causal factors in his interesting case. The immediate cause of the dropsy he found in narrowing of the pulmonary ostium of the heart, accompanied by cirrhosis of the liver and incipient granular degeneration of the kidneys. The state of the heart he ascribed to fœtal endocarditis; and he was supported in this view by the other signs of inflammatory disturbances present in the fœtus,—these were peritonitis, nephritis, hepatitis, and splenitis. The transposition of the viscera which was found might also be of inflammatory origin. The cause of the fœtal endocarditis in its turn, he thought, might be found in rheumatism or in syphilis of the mother; but he was unable to get information upon this point. The thromboses in the maternal placental sinuses he regarded as a third series of disturbances, which by hindering the circulation in the fœtus tended still further to promote the general dropsy. The primary causes of the fœtal disease were, however, the heart defect and the diseased state of the large abdominal viscera. Virchow adopted, therefore, the theory of a mechanical production of the dropsy. Strauch also, as has been said, emphasized a mechanical mode of origin; but admitted that hydræmia of the mother, and perhaps other things too, might have been causal factors.

Mattersdorf explained his case by the supposition that the nephritis of the mother led to maternal and fœtal hydræmia, and that some change in the vessel-walls of the fœtus allowed transudation of serum to take place.

Hönck, in his third case (No. 54 *c*), sought for the origin of the fœtal dropsy in the existence of malaria with enlarged spleen in the mother, aided by a transmitted malarial state of the blood of the fœtus. The obstructed maternal circulation led to œdema of the placenta, and this in its turn to obstruction in the fœtal circulation.

Sänger (No. 56), like Klebs, found congenital leukæmia in his specimen. The mother showed signs of nephritis (albuminuria, albuminuric retinitis, etc.), but this he did not regard as the direct cause of the fœtal dropsy; for, as he pointed out, dropsical infants were rarely born to mothers suffering from kidney disease. The nephritis of the mother caused the leukæmia of the fœtus, not in a mechanical way, but because the hydræmic state of the maternal interfered with the normal formation of the fœtal blood by producing a dilution of the fluid passing to the fœtus. The leukæmia thus produced was the cause of the dropsy; for the conversion of leucocytes into erythrocytes having been interfered with, the former accumulated in the fœtal blood, escaped through the thin vessel walls, and formed lymphoid infarcts in the glandular organs, lungs, muscles, and skin; and serum escaping along with the leucocytes, caused œdema of the above-mentioned structures. Sänger considered that a similar transudation of serum took place within the placenta fœtalis, and that fluid passed from the vessels of the villi into the villous connective tissue. He found the blood in the villous vessels leukæmic. He did not, therefore, agree with Klebs, but thought that there was dropsy of both the maternal and fœtal parts of the placenta. Further, he did not accept Klebs' view of the existence of intervillous lymph spaces. Finally, Sänger thought that the leukæmia of the fœtus could not be due to maternal leukæmia, for no leucocytes could pass through the placenta; unfortunately he did not examine the blood of the mother.

The etiology of Lohlein's case (No. 58) was worked out by Fuhr (No. 64), who recognised its complexity, but thought the cause lay

chiefly with the mother. He looked upon the spurious diaphragmatic hernia as an effect, not as the cause, of the fœtal dropsy. He excluded from the etiological possibilities the maternal cardiac disorder (mitral insufficiency) because compensation had been established, and the maternal albuminuria because, being intermittent, it was the sign not of chronic nephritis, but of pregnancy-nephritis predisposed to by the hydramnios and state of the mitral valve; and he assumed, from the existence of spina bifida, that the fœtal dropsy existed before the fourth month of pregnancy, and that the fœtal ascites was prior to the hydrothorax. No microscopical examination of the placenta was made, but Fuhr believed that its large size was due not only to the presence in it of serum, but also to a true hyperplasia of the villi. He looked upon the hyperplasia as primary, and as the cause of the fluid in the fœtus and the hydramnios; whilst to explain the anasarca he deduced fœtal hydræmic plethora from the maternal hydræmia, which in its turn came from the pregnancy and the nephritis. The cause of the hyperplasia in the chorionic villi he found in endometritis of the serotina, and the œdema of the placenta he held to be due to secondary obstruction in it, from the over-filling of the fœtal circulation. The etiological factors he summarized as follows:—(1.) Chronic maternal endometritis, which probably began in the third puerperium, but was intensified in the sixth pregnancy by the nephritis; (2.) The decidual increase thus induced caused hyperplasia of the chorionic villi and the formation of a large placenta; (3.) Then ensued an excessive absorption of fluid blood into the fœtal circulation (favoured, perhaps, by the hydræmic state of the mother's blood), over-filling of the circulation in the fœtus, with resulting obstruction and œdema, for no hypertrophy of heart and kidneys took place; (4.) The hydramnios in the latter part of the pregnancy was to be referred to increased secretion of the kidneys,—an increase, however, insufficient to compensate for the obstruction; and, (5.) The œdema of the placenta was due to secondary obstruction in the placenta.

In addition to the above-mentioned theories brought forward by writers who have described cases of general dropsy in the human fœtus, there is an observation drawn from the field of experimental

teratology, which must not be passed over in silence, for it serves to throw some light upon the origin of this fœtal disease.

It is one that has been made on many occasions by Dareste (No. 65) when experimenting with the artificial incubation of the hen's egg. Both Tarnier (No. 53) and Taruffi (No. 59) refer to this observation when discussing the causation of fœtal dropsy, and suggest that from it conclusions as to pathogenesis may perhaps be drawn. Dareste has shown that various external conditions interfere with the normal development of the embryo in the hen's egg, and he has been able to produce most of the known fœtal monstrosities by altering the environmental conditions during the process of artificial incubation. By raising or lowering the temperature of the surrounding air, by covering the shell of the egg with varnish, by placing the eggs vertically, etc., he has succeeded in so disturbing the healthy development of the embryo as to lead to the appearance of monstrous forms. One of the most common results of this artificial interference with the growth of the embryo chick has been the production of an anæmia, either simple or complicated with dropsy. Now, this artificially produced dropsical anæmia of the chick may serve to throw some light upon the origin of general dropsy of the human fœtus which we have seen to be often associated with anæmia. Dareste has found that it is produced in the following manner. One of the earliest changes in the impregnated ovum of the hen is the formation of the vascular area; this surrounds the embryo, and in it is found a network of bloodvessels surrounded by a circular vein. The network of vessels is formed by the projection and anastomosis of offshoots from the blood-islands which are found in the vascular area, and ultimately the network thus produced is brought into relation with the heart through the omphalo-mesenteric veins and arteries. If this communication be not effected, the blood in the heart and vessels remains colourless, and contains no globules—it is a colourless plasma. Now, Dareste found that by altering the normal external conditions in artificial incubation the "islands of blood" could be arrested in their development and the canalization of the vascular area prevented. As a result, the blood globules remained stored up in the blood-islands and did not reach the cavity of the heart. In such a case the blood sent by the heart

through the body of the embryo remained colourless and transparent, and the organs and tissues with which it came in contact became dropsical, probably on account of the absence of albumen from the circulating fluid. Dareste also noted that the fluid not only lay between and within the mesodermic cells, but might accumulate in the pleuro-peritoneal sac, in the cerebro-spinal canal, and in the amniotic cavity. This condition was always found to be produced at a very early period in the development of the embryo. When the dropsical anæmia was complete it brought about the death of the chick, but when incomplete it caused various malformations, such as spina bifida, anencephaly, etc.

It is now possible to group together in a provisional manner the probable causes of general fœtal dropsy, although it cannot, of course, be affirmed that each group is distinct from and independent of the others. No doubt they overlap to a considerable extent, and may possibly all be present as etiological factors in some cases.

I. It is within the limits of possibility that there may be a group of cases in which the primary pathological impulse comes from the father, and is impressed upon the ovum by the spermatozoon at the time of fertilization. It must be admitted that little is definitely known of the influence of paternal conditions upon the embryo; but still it is not to be denied that the only rational explanation of certain cases of fœtal disease and of the transmission of some physiological and pathological peculiarities is to be found in the existence of such influences in the spermatozoa. Some cases of hereditary syphilis, and some of transmitted structural anomalies affecting only the males, may be cited as examples. No one has yet affirmed that in general fœtal dropsy the cause lay with the father; but two or three writers have put the matter interrogatively, and in connexion with my own cases it is a striking fact that a sister and a brother, both markedly anæmic, should have in the one case borne and in the other begotten a dropsical infant. It rests with future observers to scrutinize this possible group of factors, and to eliminate it from or establish it in the etiology of the disease.

II. In a second group of cases it may with some confidence be affirmed that the cause of the dropsy is to be found in a lesion of the fœtus itself. When general dropsy in the twin fœtus comes to be

considered, it will be seen that in nearly every recorded case an adequate fœtal cause has been discovered; but this is not so with regard to general œdema of the single infant, for although most writers state that they sought for a fœtal cause, they have in many cases to confess that the search was without result. As was to be expected, the attention of observers has been turned chiefly to the state of the fœtal heart and kidneys.

In three cases (Nos. 35, 43, and 60) cardiac malformations were regarded as the direct cause of the general dropsy; and in two (Nos. 35 and 60), the malformation consisted in nearly complete closure of the foramen ovale with a widely patent condition of the ductus arteriosus. In my first specimen the section unfortunately passed through the foramen ovale, but in my second the foramen was seen to be less patent than it ought to be at the term of intra-uterine life which had been reached, and in both cases the ductus arteriosus was widely patent. If the course of the fœtal circulation be borne in mind, it is possible to construct a theory which will attribute the dropsy of the fœtus and placenta to the above-named anomaly. It is necessary to grant that the passage of the blood (arriving in the right auricle from the inferior vena cava) through the foramen ovale is greatly impeded by the almost complete closure of that opening. In such a state of matters the blood will tend to pass through the tricuspid opening into the right ventricle, but its progress will be impeded by the Eustachian valve, and so the blood-pressure in the right auricle will rise. This effect will be intensified by the arrival in the same chamber of the blood from the vena cava superior. The consequence of this will be a rise in pressure in all the parts from which the venæ cavæ come (the whole body and placenta); and, adopting the theory of the mechanical origin of dropsy, there will result serous effusion, affecting first the placenta, which is the extreme limit of the circulatory system of the fœtus, and later the whole body of the infant. If, as has in some cases been found, the vessel walls be thin, the escape of serum will be rendered the more easy on that account. This theory explains also the dilatation of the ductus arteriosus, for through it the greater part of the blood must pass into the aorta. In a somewhat similar way the general dropsy in Pott's case (No. 43) may be explained. Here the stenosis of the ostium

arteriosum of the three-chambered heart probably led to obstruction in the venous system, and, since hypertrophy of the right auricle and of the single ventricle did not occur, effusion of serum followed; the cirrhotic condition of the liver caused by the congestion explained the ascites. If it be granted that in some cases of general dropsy the above-named mechanical theory is the correct one, still the cause of the heart lesion is left obscure, and it can only be surmised that it may have been due to localized endocarditis of unknown origin. In Virchow's case (No. 30) there is ground for supposing that the cardiac anomalies were due to fœtal endocarditis, for there were other inflammatory states present, *e.g.*, peritonitis. The narrowing of the pulmonary ostium, the hepatic cirrhosis, and the incipient granular renal degeneration, were regarded by this writer as the immediate cause of the dropsy. Virchow, therefore, like Tait, Osler, and Pott, adopted the mechanical theory of origin; but, unlike them, he recognised that some maternal influence (rheumatism or syphilis) must be invoked to explain the fœtal inflammatory states.

Other writers have ascribed the dropsy to an obstruction in the circulatory system outside the heart. Behm's supposition that the diaphragmatic hernia compressed the inferior, and to some extent also the superior vena cava, and so led to general dropsy, whilst it may have held for his case, must be looked upon as one of the rarest of all causes. Obstruction to the blood-flow through the kidneys from cystic degeneration of these organs (Nos. 54 *b* and 63) can scarcely be regarded as a sufficient cause of general dropsy, for cases of cystic kidney in the fœtus in which there was no dropsy have not infrequently been recorded. If, however, this cause be accepted, it would seem more rational to ascribe the dropsy to the pressure exerted by the large renal tumour upon the vena cava inferior or upon some other large vessel. The obstruction caused by the infiltration of liver and kidneys with leucocytes (No. 67) is another theory of origin which it is very difficult to accept as a complete explanation of the disease, for the effects appear so much greater than the cause.

The question of the relationship of syphilis to this disease will be discussed later; and with regard to the theory of the lukæmoid origin of the dropsy, that matter will more conveniently be

considered along with the alleged combined maternal and fœtal causes. In the meantime it may be granted as probable that in some cases the fœtal dropsy is due to fœtal causes leading to obstruction of the circulation either in the heart or in the large vessels, the dropsy in these specimens being regarded, therefore, as mechanical in origin, an œdema of engorgement. This view receives some support from the fact, that in the cases in which a sufficient fœtal cause was found, there was, as a rule, no distinct maternal lesion.

III. It is doubtful whether there are any cases of general fœtal dropsy which can be referred to a maternal cause alone. The older theories (Nos. 4, 15, and 21) may be dismissed as most unlikely explanations, and so may some of the modern ones, *e.g.*, Ruge's (No. 51). The only maternal conditions that require serious consideration are diseased states of the kidneys and of the blood. At first sight there appears to be much in favour of the theory that a maternal disease alone may cause the fœtal dropsy; for the mother of such a fœtus is, in the majority of the reported cases, an elderly multipara who has suffered in various ways during pregnancy (from dropsy, albuminuria, hepatic and gastric disorders, etc.), and has had a bad previous obstetric history. Further, in some cases (Nos. 31, 51, 61, and 66) the same mother has borne two or more dropsical infants in succession. When, however, the clinical facts in the mother's history are closely examined, they are found capable of bearing another explanation, for most of them are quite as likely to be consequences of the fœtal state as causes of that condition. The anasarca, the gastric and hepatic troubles, and the albuminuria, can all be reasonably explained by the pressure upon vessels and viscera produced by the over-distended state of the uterus, which is in its turn due to the large size of the fœtus and placenta, and to that frequent concomitant of the disease, hydramnios. Further, the rapid disappearance of these abnormal symptoms which usually immediately follows the birth of the infant also supports the belief that these symptoms were effects and not causes of the fœtal disease. One is therefore warranted in concluding that in most cases the albuminuria, when it did exist, was due to a pregnancy-nephritis, and not to a permanently diseased state of the mother's kidneys.

Strauch's case (No. 45) appears to militate against the acceptance of the above statements. The patient, in this instance, seems to have had true granular atrophy of the kidneys, and the author argues that this increased the blood-pressure in the mother, that serous exudation into the maternal portion of the placenta followed, and that in consequence of this there occurred an obstructed flow of blood through the fœtal part of the afterbirth, and general dropsy of the fœtus. Against this view it has to be remarked that œdema of the maternal part of the placenta is hypothetical, for Strauch did not examine it microscopically, and that in the cases in which the placenta has been investigated in this way the dropsy was found to affect the fœtal part (the chorionic villi) and not the maternal. Further, it is well known that whilst mothers with kidney disease are not uncommon, it is very rare for them to give birth to dropsical infants. The maternal disease has an unfavourable effect upon the infant, for it is often born prematurely (dead and macerated, or alive, feeble, and poorly nourished); but it is quite exceptional for it to be the subject of general dropsy. I had an opportunity recently of examining such a case; the fœtus was still-born and premature, but showed no effusions, and its kidneys exhibited no morbid conditions when viewed under the microscope. Even Strauch, who is the strongest advocate of the theory of the origin of fœtal dropsy from maternal renal disease, is forced to admit that his supposition does not explain all the facts of the case, and that it may be necessary to grant the co-existence of fœtal hydræmia and possibly of other causal factors.

The writers (Nos. 29, 33, 34, and 49) who have looked upon a diseased state of the mother's blood as the sole cause of the fœtal disease do not attempt to explain the *modus operandi;* and those who have supposed that the dropsy had its origin in disease of the maternal placenta alone have not made a microscopical examination of that structure. There is no necessity, therefore, to refer further to these states, at any rate as sole factors, of the disease of the fœtus.

IV. In a fourth group may be placed the cases which appear to be due to combined maternal and fœtal morbid states, and in the present condition of our knowledge it would seem that here are to be placed most of the specimens of general dropsy of the single

fœtus. Several recent writers have taken this view of the case, for it has been found to be almost impossible to discover either in the mother alone or in the fœtus alone a sufficient and satisfactory cause of the dropsy.

It is fair to surmise that in most cases the mother of a dropsical infant has been far from perfectly healthy herself: it is distinctly stated in certain instances that she was anæmic, hydræmic, icteric, or affected with albuminuria, malaria, valvular disease, rheumatism, or syphilis; and in many of the cases in which no such morbid states are mentioned it may be inferred from the clinical history that she was below par, and probably was anæmic to a greater or less degree. Moreover, there is reason to believe that in but few cases was the uterine mucous membrane quite normal, for the history of repeated premature labours or of miscarriages is often forthcoming, and suggests a chronic endometritis that has interfered with the normal formation and functional activity of the maternal part of the placenta. In one case (No. 64) chronic endometritis of the serotina was looked upon by the writer as the cause of hyperplasia of the chorionic villi; but it is unfortunate that in this instance a microscopic examination of the placenta was not made. There are then two possible etiological factors on the part of the mother: these are—the circulation of a vitiated blood in the maternal portion of the placenta, and the abnormal formation of that structure on account of a diseased state of the serotina consequent upon chronic endometritis.

It is possible to suppose that the structural change in the maternal part of the placenta might be so great as to cause obstruction to the circulation in the fœtal part, and so lead to dropsy of it and of the fœtus; but in the absence of direct proof from microscopic examination this hypothesis must be looked upon as very doubtful. It is more likely that the maternal morbid states above named act in a bio-chemical way upon the fœtus, inducing in it diseased processes which are the causes of the dropsy. These processes we may suppose to be due to the fact that an impure or insufficiently nourishing blood is supplied to the fœtus, or that through interference with the excretory functions of the placenta, a hydræmic or otherwise abnormal condition of the fœtal blood is set up and maintained. Virchow (No. 30), for instance, thought that in some

obscure way rheumatism or syphilis in the mother set up various inflammatory states in the fœtus, amongst which was endocarditis, which led to a cardiac anomaly which in a mechanical way caused the dropsy. This explanation may prove to be correct in some cases; but it seems more probable that the fœtal change induced is a blood one, and that it produces the dropsy in a chemical rather than in a mechanical way—that, in fact, the dropsy is cachectic and not congestive or inflammatory in origin. What is the exact nature of the cachectic state of the fœtal blood must for the present be doubtful; it is possible that it may be hydræmic or anæmic, or, as in the cases of Klebs and Sänger, leukæmic. If it be granted that fœtal leukæmia exists and is the cause of fœtal dropsy, it is necessary also to grant that it differs in many respects, but chiefly in degree, from that disease as it is found in adults. Sänger noted with regard to his specimen that the leukæmia must have developed very rapidly, for the appearances found were like those of the most advanced stage in the adult. This fact may serve to explain why it is that general dropsy is only occasionally met with when leukæmia affects the grown-up individual.

As evidence in support of the cachectic origin of fœtal dropsy, I may adduce the results of the analysis of the ascitic fluid in my second case (No. 66 *b*). It will be remembered that the proportion of proteids was exceedingly small; and if we accept Runeberg's statement that ·3 per cent. albumen and below it always indicates hydræmic ascites,[1] it may be concluded that in this case, at any rate, there was a blood dropsy. The thin-walled state of the bloodvessels which has been observed may still further have favoured the occurrence of dropsy. Dareste's experiments seem also to support this view, although it is perhaps scarcely permissible to draw deductions concerning the mammalian fœtus from what happens in the case of the chick. It may, however, be borne in mind that the artificially produced dropsy in Dareste's cases was an anæmic one.

It may then be said, in conclusion, that whilst in some cases of fœtal dropsy there existed an adequate cause in the fœtus itself, in most instances the disease was due to a chain of factors, having a

[1] *Deut. Arch. für Klin. Med.*, xxxiv. p. 1, 1883.

cachectic state of the mother at one end and a blood disease of the fœtus at the other, with a morbid state of the uterine mucosa and placenta intervening.

Diagnosis.

The condition of general fœtal dropsy is one which it is comparatively easy to recognise after the infant is born, but which it is well-nigh impossible to diagnose during pregnancy.

In Pregnancy.—It may safely be said that we are unable in the present state of our knowledge to diagnose with any certainty the presence of a dropsical fœtus in the uterus of the mother. The conjunction of the peculiarities in the maternal obstetrical history which have been detailed, with the existence of a uterus larger than is natural for the ascertained date of pregnancy, may suggest the condition of fœtal dropsy, and if the mother have previously given birth to an œdematous fœtus, the suggestion may be worthy of consideration; but as a general rule there will be little hope of giving more than the most provisional diagnosis. For dropsy, albuminuria, and blood disorders of the mother may all be present, and the infant when born may nevertheless show no sign of general œdema, and the large size of the uterus may be due not to this fœtal disease, but to the presence of twins or to hydramnios. To make the recognition of the condition still more difficult, hydramnios may, and often does occur as a complication.

In Labour.—After labour has set in, and after the membranes have ruptured, it may be possible from the palpation of the presenting part to recognise the presence of anasarca. It is not at all improbable, however, that the œdematous condition itself may retard instead of facilitating the diagnosis, for in certain of the recorded cases in which the anasarcous head presented it was at first thought to be the breech from the softness of the parts and from the difficulty in feeling the cranial bones; and even when it was made out that it was truly the head, the conditions were regarded as due to an unusually large caput succedaneum. At this stage of labour a diagnosis is most likely to be made when a foot or a hand presents. It is usually later in the confinement when part of the child has been born that it becomes possible with some degree of accuracy to foretell the condition of affairs.

Thus in cephalic presentations it will be found that after the birth of the head there is great delay in the labour, and then, from this fact and from the appearances of the head and neck, and from the friability of the tissues, the dropsical condition of the fœtus may be inferred. It must not be forgotten that delay in the birth of the trunk may be due to other causes, *e.g.*, large size of the child; special abdominal distension from an overfilled bladder, from tumours of the abdominal viscera, etc.; the presence of a double monster; malposition of an arm; shortness of the cord, etc. Such conditions can, however, be in most cases excluded by introducing the hand into the vagina and carefully examining the fœtal parts. When the presentation is pelvic or transverse, the dropsical nature of the fœtus may be ascertained at an earlier stage of the labour than when the vertex is the presenting part.

After Labour.—The appearance of the infant when born is so characteristic that the observer can hardly fail to recognise the disease if he keep in mind the existence of the morbid state, and especially if he have on some previous occasion seen a similar case. The diagnosis will be complete when a cut has been made into the skin and when the body-cavities have been opened.

What has been said above is true with regard to the dropsical fœtus that is alive at the time of birth, or that has succumbed during labour; but if death has occurred some time before confinement comes on, the changes due to maceration will mask the characteristic appearances of fœtal dropsy and render the diagnosis difficult. Of course the appearances of a macerated fœtus are quite different from those of a living or still-born dropsical infant; but it is not easy to separate them from those of a dropsical child that has died some time before birth. It is especially difficult to differentiate *hydrops sanguinolentus fœtus* from *hydrops universalis fœtus* when the latter affects a dead-born infant; but the discovery of syphilitic tissue lesions in the former and that of adequate causes of general dropsy in the latter may simplify matters somewhat. The state of the placenta cannot be relied upon for diagnosis, for there is reason to believe that the death of the fœtus may mask the characteristic dropsical appearances of that structure in general fœtal anasarca. It may be of some assistance to remember that the organs of the generally dropsical fœtus are

usually anæmic, whilst those of the macerated fœtus are most often sanguinolent.

It is not, as a rule, difficult to diagnose between general dropsy and *hereditary syphilis* in the living infant; but if the syphilitic infant be dead-born, it usually takes the form of hydrops sanguinolentus fœtus, and, as has just been said, differentiation then becomes almost impossible.

From *fœtal peritonitis*, with or without intra-uterine death, it will often be difficult to separate general fœtal dropsy. Indeed, it would seem that in some cases the former state is present as a complication of the latter, and I am inclined to consider the sixth case recorded by Simpson in his paper on fœtal peritonitis (19) as an example of this.

Ascites in the fœtus is easily distinguished from general dropsy by its localized nature, and by the absence of general anasarca.

Elephantiasis congenita cystica shows a dropsical state of the subcutaneous tissue, accompanied by serous accumulations which sometimes produce large and deforming tumours, especially upon the head. It can, therefore, usually be distinguished from general dropsy in the single fœtus; but, as will be seen later, it so closely resembles the cases that have been described as general dropsy in the twin, that it becomes doubtful whether it can or ought to be separated from that disease.

Prognosis.

The question of prognosis has already been mentioned in connexion with the clinical details of the various cases, and little requires to be added to what has already been said.

a. Maternal.—As regards the mother, it would appear that the occurrence of general dropsy of the fœtus seldom or never produces any permanent evil effects upon her general health. She may suffer from discomfort, and may even be seriously ill, during the later months of her pregnancy, and she may have a labour requiring considerable instrumental interference; but the puerperium is usually perfectly normal, and she is soon as well as she was before the beginning of the pregnancy. In only three cases (49, 56, 67) have maternal deaths been mentioned, and the causes were

peritonitis, nephritis, and puerperal fever with vulvar diphtheria, respectively.

b. Fœtal.—The fœtus, however, has a very small chance of life in general dropsy. In every case a fatal issue has had to be recorded. Even when a viable age had been reached, the prognosis was not much modified; for in every instance the infant was either dead-born, or still-born and could not be resuscitated, or lived for only a few minutes, hours, or at the most days. It would seem, therefore, that the disease is not compatible with extra-uterine existence.

Treatment.

a. During Pregnancy.—Little or nothing is at present known with regard to the ante-natal treatment of general fœtal dropsy. The recorded clinical histories, since they in many instances revealed morbid states in the mother, of course show that it would be well in every case of pregnancy to ensure a healthy state of the maternal organism. This is not always possible; but in the cases in which the progress of morbid states of the mother can be checked, there may be some chance of retarding the advance of the fœtal malady also. Thus, should the mother be affected with albuminuria, a milk diet accompanied by the administration of mild diuretics would be indicated; and should any other morbid state—*e.g.*, syphilis—exist, the appropriate treatment would be called for. In Dr Freeland's case the mother, who was very anæmic, took chlorate of potash regularly throughout one of her pregnancies; and although a dropsical infant was born, yet she was able to carry her child to a later period of pregnancy than previously. In a subsequent pregnancy, during which the potash salt was not given, labour occurred as early as the sixth month. In any case where an anæmic woman has given birth to a dropsical infant and is again pregnant, it would be well to try the effect of a combination of iron and potash salts in the hope of producing a healthy state of her blood, and so lessening the chance of the development of a fœtal disease. Further, if a woman who has had a dropsical fœtus be found to be suffering from endometritis, it would be advisable before she again conceives to treat the abnormal intra-uterine condition.

b. During Labour.—The treatment necessary at the time of

confinement must vary with the requirements of the case. Sometimes no interference is needed, as in cases in which the pregnancy has not reached the full term. At other times the labour is delayed both on account of the large bulk of the fœtus and placenta, and of the weak uterine action produced by the hydramnios; under such circumstances, various lines of treatment may be indicated. Sometimes, as in a vertex presentation, the use of forceps may be required, or traction upon the shoulders, either by the hand or by a blunt hook in the axilla, may be necessary for the complete delivery of the child; at other times, as in breech cases, paracentesis abdominis may have to be performed before the infant can be extracted. It is possible also that in some instances it may even be necessary to break up the head with the basilyst and perforate the thorax, and through it the abdomen. Special emergencies may arise which will demand special treatment. The friability of the fœtus, which has sometimes been noted, may prove a very disturbing factor to the successful conduct of the labour. For many reasons it is evident that strict antiseptic precautions must be taken in all such cases, for two out of the three deaths seem to have been due to sepsis. In the third stage the placenta may be retained, and manual extraction may become necessary.

c. After Labour.—In the great majority of cases the puerperium has been absolutely normal; but danger may be looked for, and the forms which it is likely to take are maternal exhaustion, hæmorrhage, and sepsis. When it is remembered that the uterus has been enormously distended, that the placenta has been large and diseased, and that the labour has often been tedious and not infrequently instrumental, it is rather surprising that hæmorrhage and pyæmia have not been more commonly met with in the puerperium.

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CHAPTER XIII.

GENERAL DROPSY IN THE TWIN FŒTUS.

CASES IN THE MONOCHORIONIC TWIN; IN THE DICHORIONIC TWIN—CLINICAL HISTORY; PATHOLOGY, OF FŒTUS, OF PLACENTA; ETIOLOGY AND PATHOGENESIS; DIAGNOSIS, PROGNOSIS, AND TREATMENT; LITERATURE.

I HAVE reserved for separate consideration the dropsical fœtus born along with a healthy infant, for its characters appear to differ in a marked manner from those met with when the œdematous fœtus is the sole result of the pregnancy. Sometimes general dropsy is found in a twin developed within a separate chorion and with a separate placenta; but it is much more commonly met with in the monochorionic variety of plural births. The latter group will be considered first.

1. Cases of General Dropsy in the Monochorionic Twin.

In the case of monochorionic twins—*i.e.*, twins developed within one chorion and with one placenta—malformations are possible which would not in other circumstances be compatible with the continuance of intra-uterine life. Examples of such anomalies are found in the acardiac, acephalic, acormic, and anidean monstrosities. It is in these malformed fœtuses that dropsy in its most advanced and most deforming degree is found, and in them the enormous amount of œdema which exists is probably always due to cardiac and vascular anomalies.

Taruffi places all deformed monochorionic twins in one group, and names them *disomiomphalo-angiopaghi* (omphalo-angiopagous twins). This group may be said to correspond to that of the *allantoidal parasites* of Ahlfeld, and the characters of its members have been thus defined by Taruffi:—"Twins of the same sex, enclosed in one chorion, of which one offers more or less grave defects in develop-

ment, and is in communication with the other, which is normally developed, by means of the vessels of the umbilical cord near the placenta." This method of grouping and this definition are useful, for they enable us to collect together those strangely aberrant monstrosities commonly described as acardiac, acephalic, and amorphic, and to understand their characters. The omphalo-angiopagous twin is very frequently the subject of a more or less general œdema, and this is true of all the three varieties into which this group of monstrous fœtuses has been divided.

The first variety of the omphalo-angiopagus is the *paracephalus*, with its sub-varieties, *dipus*, *apus*, and *pseudoacormus*. Of the paracephalus dipus there are again two kinds, the *paracephalus dipus cardiacus* and the *paracephalus dipus acardiacus*. The paracephali are defined as "omphalo-angiopagous twins, of which one has the head (cranium or face) and the extremities more or less defective; and sometimes with the absence of the lower limbs is associated also that of the trunk" (Taruffi). In the case of the p. dipus variety we have to do with twins of which one is certainly furnished with a head, a trunk, and lower extremities; but these parts are all more or less deformed, whilst the upper limbs are specially anomalous, and may even be absent. These fœtuses may have a heart, usually deformed (dipus cardiacus), or they may not possess this organ (dipus acardiacus).

It is an interesting fact, that all the cases of dropsy in the omphalo-angiopagous twin that have been recorded, with titles specially emphasizing the presence of the dropsy, seem to have belonged to the variety paracephalus dipus cardiacus. The reason is probably to be found in the fact that in the remaining varieties the other abnormalities were so evident as to make the existence of subcutaneous œdema appear to be a secondary and minor characteristic. In specimens of the paracephalus dipus cardiacus, on the other hand, the most obvious external peculiarity was often the anasarca, and so observers were led to choose a descriptive title laying stress upon this condition. I shall here describe in detail only the cases belonging to the last-named class, for the others will be considered at another time.

The first case in which general dropsy was specially noted in a twin of the variety paracephalus dipus cardiacus, seems to have

been that recorded by Louyse Bourgeois (1)[1] in the early years of the seventeenth century. This observer, who was the midwife of Marie de Medici, and was born in 1564, described a confinement which took place at the seventh month, and resulted in the birth of twins, both females, of whom one was healthy and the other the subject of anasarca. It is impossible from the account given to say whether or not this was really an example of omphalo-angiopagous twins of the paracephalic variety, but it is extremely likely that it was.

The next specimen was that described first by A. Tamm, in 1857, in his inaugural dissertation, *De Hydrope Fœtus Anasarca;* and later by J. W. Betschler, in his communication entitled "Zur Dystokie e Fœtus Hydrope Anasarca" (Nos. 8 and 9).

The mother was 26 years of age, had begun to menstruate when 15, and had continued to do so regularly, and had always enjoyed good health. She was a iv.-para. Her first pregnancy had ended naturally in the birth of a male child; in her second, abortion took place; and her third went to the full term, when a female infant was born in a normal way. She was quite able to nurse her children.

Her present pregnancy, the fourth, had reached the seventh month when labour set in. She had first felt movement in the fifth month, and had noticed that her abdomen was much larger than in previous pregnancies, but she had observed no signs indicating death of the fœtus. Labour pains were strong, and after they had lasted during a whole night, the waters came away and uterine contractions ceased. The midwife in attendance then found that the head was not presenting, and sent for help to the Obstetric Polyclinique. The presentation was discovered to be a shoulder, and the right arm was lying in the vagina. Soon afterwards the pains returned, and a well-formed but dead female fœtus was born by spontaneous evolution, or *partus conduplicato corpore.* It was a seven months' infant, and had evidently died during labour. Immediately after the birth of this child it was observed that the mother's abdomen remained unusually large, and an examination revealed the presence of a second fœtus presenting

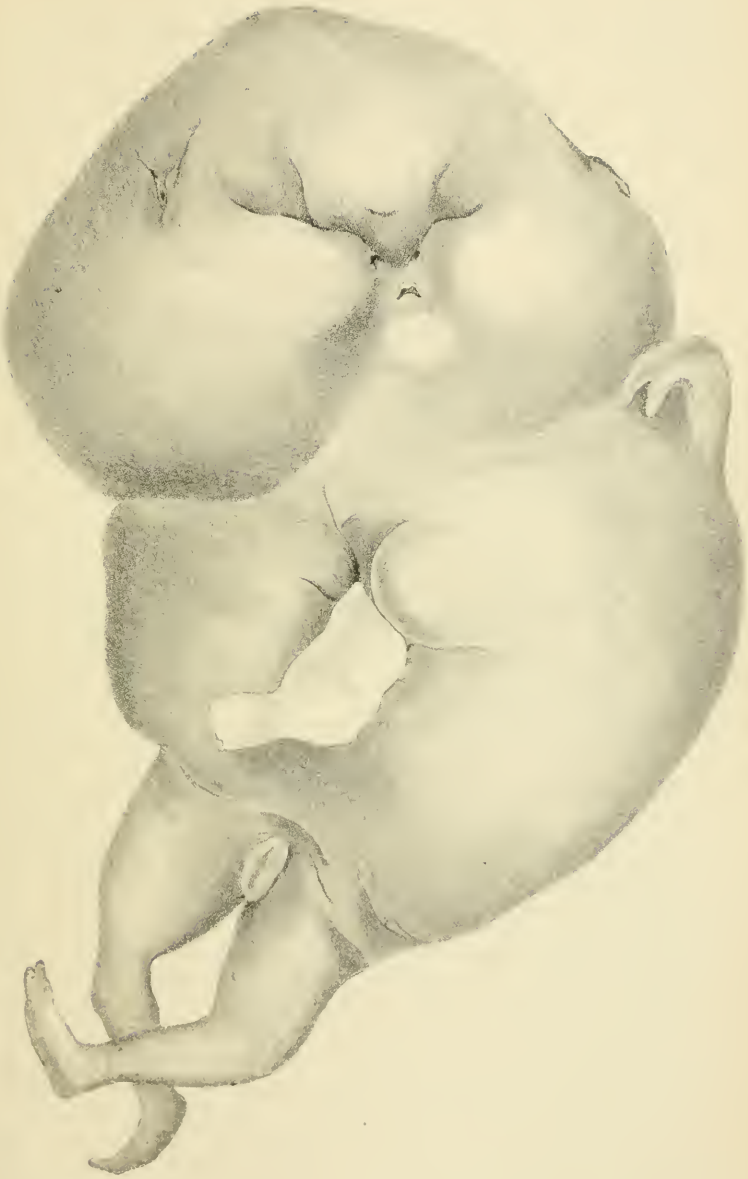
[1] The figures refer to the bibliography at the end of this chapter.

by the feet. Traction did not serve to complete the labour, and it was found that there was distension of the fœtal abdomen. Before, however, instruments for the performance of paracentesis could be obtained, the second infant was expelled by the natural efforts (about one hour after the birth of the first). The medical men in attendance could scarcely at first believe that they had to do with a real infant, so deformed was it. The placenta soon separated and was easily removed, and the mother made a rapid and complete return to her former healthy state.

The twins were both females; but the first born was, save for the signs of prematurity, normal in appearance, whilst the second was greatly deformed (Plate VI.). It measured 33 cms. in length, and weighed fully 8 lbs. The head and trunk were three times as large as the lower limbs. Whilst there was a slight indication of a neck, the thorax and abdomen seemed to form a continuous whole. The right half of the head and the left half of the body were larger than the parts on the opposite side.

The head was like that of an uhu (eagle-owl), and was chiefly made up of three large projections, containing fluid, two laterally placed, and one in the centre above the nose. The eyes were hidden from view, and the nose and mouth lay in the median depression between the projections. On the left side of the trunk was a claw-like rudiment of the upper extremity with two fingers, but on the right side was no indication of an arm or hand. The thorax and abdomen formed a large tumour, trapezoid in shape as seen from the front. In the umbilical region was a fissure in the integuments, from the lower part of which protruded the greatly swollen umbilical cord. The external genital organs were normal. The lower limbs were not affected with anasarca, and were in consequence small in size when compared with the trunk and head. The left foot had two toes and the right only one.

The skin of the trunk and lower limbs had a reddish colour, as had also that of the head projections; the rest of the skin of the head was yellowish. Here and there the integument was glossy. The subcutaneous tissue of the head and trunk was so thickened by the dropsical anasarca as to measure at some places 1½ inch. Incisions in it allowed not a limpid, but an almost coagulated fluid to escape. The muscles were soft and infiltrated with serum.



Betschler's Specimen of General Dropsy in the Twin Fœtus.

There was a meningocele at the root of the nose, and both internal and external hydrocephalus; the lateral ventricles contained much clear fluid, and the brain substance was greatly diminished. There was some fluid in the thoracic cavity, and whilst the heart and thymus were normal, the lungs were very small and compressed. The trachea and œsophagus ended blindly about the level of the second dorsal vertebra. The abdomen contained a large quantity of fluid, several of the viscera were too small, and were infiltrated with serum. The intestines were narrow, and contained much fluid. The urethra and ureters were pervious.

There was one well-formed placenta, near the centre of which both cords were inserted. In the small space intervening between the two insertions, a vein was seen passing from the vein of the one umbilical cord to that of the other. The cords were 2 feet in length, and on the vein of that belonging to the dropsical fœtus, about 3 inches from the umbilicus, were three twists, in which were thrombi, producing a narrowed lumen, and the signs of phlebitis were present.

W. Nieberding, in his work on the origin of hydramnios (16), recorded a case of general dropsy in a twin fœtus.

The mother's pregnancy was interrupted at the end of the sixth month, and uniovular twins were born. No cause for the premature labour was to be found in either mother or father, who were free from any trace of syphilis.

The twins, which were females, differed in size. "The larger one showed accumulations of fluid in its body cavities, and was also the subject of general anasarca. The heart and kidneys were considerably hypertrophied, and all the organs were infiltrated with numerous white and red blood corpuscles. There was dilatation of the urinary tubules, and the bladder was distended with urine; but the urethra was quite pervious. The cardiac hypertrophy was specially on the left side. There were also important changes in the ductus arteriosus: there was such an increase in the thickness of its muscularis and intima that near to the pulmonary artery its lumen was almost obliterated. There was, therefore, premature obliteration of the ductus arteriosus. The smaller fœtus showed no anomalies save a certain amount of hyperæmia of the intestines."

The placenta was single, and had an elliptical form. The part of it which served to nourish the dropsical fœtus was of considerable size and thickness; its tissue was looser in structure than that of the other part, and it was to a large degree infiltrated with serum. Only one of the two amniotic sacs, that in which lay the dropsical fœtus, contained such a large quantity of liquor amnii as to constitute hydramnios.

In 1889 Smith and Birmingham (18) reported a case of œdema in a twin fœtus that was probably of the monochorionic variety; but in the absence of any account of the after-birth, it is impossible to be certain on this point.

The mother was a healthy woman, and had a good family history. The twins were males, and were born at the twentieth week of pregnancy. Whilst one was normal in appearance, the other was greatly deformed by œdema, and was about three times as large as its brother.

The œdematous fœtus was likened "to two large tomatoes strung together, one being represented by the head, the other by the body, and this resemblance was enhanced by the peculiar pinkish colour of the skin." The skin was raised all over the body by an infiltration of the subcutaneous tissue, with a glairy fluid like white of egg. In parts this tissue was three-quarters of an inch in thickness as compared with 1-50th of an inch in the healthy fœtus. So great was the œdema of the scalp, that the cranial bones could not be felt. "The head was made up of a number of puffy swellings, separated by deep sulci. . . . These sulci were natural depressions, which were made sulci, sometimes half an inch in depth, by the enormous œdematous distension of the subcutaneous tissue in the intervals between the depressions." In the region of the face the eyes were hidden altogether from view, and found only after considerable dissection. "The muscles and other tissues of the body which contain much areolar tissue were also markedly œdematous." There was no trace of the thoracic duct either in the thorax or at the root of the neck; the receptaculum chyli was absent; and no mesenteric glands were to be found even on microscopic examination. The heart, the thoracic bloodvessels, the thyroid gland, and other organs were normal. Under the microscope the skin and subcutaneous tissue showed

numerous large spaces, some empty, others filled with a colloid material regarded as coagulated lymph.

The authors above named were those who specially emphasized the presence of general dropsy in monochorionic twins; but many other writers incidentally mentioned its presence in deformed fœtuses of this kind. Uccelli, in 1832 (5), described an omphalo-angiopagous twin of the variety paracephalus dipus cardiacus, which appeared to be little more than a shapeless mass of flesh infiltrated with serum; Metzner (6) noted that in one fœtus from a case of triplets there was enormous œdema; and Vrolik (7), in 1855, related the case of a much deformed twin that had great subcutaneous œdema, accompanied by cyst formations. There were in all these cases grave structural defects, but a deformed heart was always present.

In the other varieties of the paracephalic twin fœtus œdema was often found, and it was specially mentioned by C. Breus (15), in his description of a case of paracephalus dipus acardiacus. Some older writers also noted its presence in this variety of monster, *e.g.*, Curtius (3) and Borgnoni (4).

When the descriptions of *acephalic* fœtuses are studied, it becomes evident that in them also subcutaneous œdema is a striking character. Of these curious monsters, which are usually composed of a more or less defective trunk with a pelvis and lower limbs, but with no head and with in some cases no heart, many examples of general dropsy might be quoted; but it will suffice to mention two, one described by A. R. Simpson in 1877 (14), and the other by Routh in 1891 (19). In Simpson's case, an acephalus pseudo-acormus, to adopt Taruffi's nomenclature, it is stated in the report that "the subcutaneous cellular tissue was remarkably œdematous, so that in making the dissection it was constantly necessary to wipe the cut surface with a sponge." In Routh's specimen, which seems to have been one of acephalus thorus acardiacus, there was "extreme œdema of the subcutaneous connective tissue."

In the third group of omphalo-angiopagous twins, to which the general name of *amorphic* has been given, general dropsy is not uncommon. This group consists of two sub-groups, one containing the *mylacephalic* fœtuses, which are like uterine moles; and the other the *anidean*, which are without any specific form. Specimens

showing general œdema have been described in both these subgroups. Sangalli (13), for example, has put on record a mylacephalic twin in which the subcutaneous tissue showed numerous cavities containing serum; whilst Cornil and Causit (10), and Elb and Credé (11 and 12), have reported anidean fœtuses in which there lay under the skin a cellular tissue layer greatly infiltrated with serum.

Cases of General Dropsy in the Dichorionic Twin.

If the cases of Bourgeois and of Smith and Birmingham be regarded as examples of dropsy in one of monochorionic twins, an examination of the literature of the subject reveals only two cases in which in a plural conception a fœtus lying in a separate chorion or having a separate placenta was affected with general œdema. I have been able to find no case in the human subject recorded in which both twins, whether of the monochorionic or of the dichorionic variety, were dropsical.

With regard to one of the two cases above referred to a short note is found in Tarnier and Budin's *Text-book of Midwifery* (17). It is there stated that Budin had seen a case of twin pregnancy in which one fœtus was affected with general dropsy; there existed two distinct bags of membranes; and only the membranes of the œdematous fœtus were infiltrated with serum.

G. Bianchi (2), about the middle of the last century, reported with some fulness a very interesting case of dropsy in a plural conception. In 1758, wrote Bianchi, a woman of Rimini was confined of triplets at the fifth month of pregnancy. The first born was wrapped up in its own secundines, was of the male sex, and had a head and neck not recognisable on account of enormous œdema. After allowing the fluid to escape it appeared as if the head was cyclopic, for there was one large orbit lying above the nose, containing one eye without any eyelids; but near the right ear another eye smaller than the first was recognised. The lower jaw was entirely absent and the upper was deformed. Of the external ears only the vestiges were to be seen. The brain was distended with dropsy. The sternum was represented by a membrane; the larynx and tongue were absent; but the clavicles and scapulæ were present. The lungs had the appearance of two

glands between which lay the shapeless heart. There was no trace of thymus gland or of diaphragm. The stomach was evident, and at its left side were two rounded somewhat obscure bodies which Bianchi suspected were the liver and spleen. The intestines appeared normal, as did also the penis, but there was no trace of a scrotum. The right arm was wanting, but the scapula and two boneless fingers were found. The left arm and the feet (contorted) had also only two digits. The other two fœtuses were well formed and were born alive; one was a male and the other a female. The pathological appearances in this case make it difficult to believe that the fœtuses were really of the dichorionic variety.

Clinical History.

Such were the cases of general dropsy in the twin fœtus that were from time to time put on record, and we have now to consider whether in their clinical histories they presented features in common or not. It may at once be stated that most writers have given a very imperfect account of the clinical details of these cases, their attention apparently having been directed entirely to the description of the various curious malformations that the dropsical fœtus usually exhibited.

A. Age of Mother.—In only five out of the seventeen cases that have been described was the age of the mother stated. In one case it was 20 (14); in another 24 (10); in another 26 (8); in Sangalli's case it was 32 (13); and in that referred to by Elb and Credé it was as much as 45 (11 and 12). In the majority of these cases, therefore, the patient was less than thirty years of age; in cases of dropsy in the single fœtus, on the contrary, by far the greater number of mothers were over thirty.

B. Previous General Health, etc.—In four cases (9, 10, 16, 18) the previous maternal health was mentioned, and in all it was good, although in one (10) it was noted that the woman was not robust. There was no record of syphilis.

C. Sexual History.—With regard to the number of past pregnancies, in two cases the patient was said to be multiparous (12, 19); in one (24) she was a i.-para; in one (20), a iii.-para, the previous children having been well formed; in one (9), a iv.-para,

two full-term healthy children and one abortion; in one (7), a v.-para, having had four healthy children by a previous husband; and in one (13) an viii.-para.

The pregnancy which resulted in the birth of twins (or of triplets in Nos. 2 and 6), of whom one was dropsical, usually came to an end before the full term. In one case (18) it ended at the twentieth week; in one (2), at the fifth month; in one (16), at the sixth month; in two (1 and 9), at the seventh month; in two (4 and 7), at the eighth month; and in three (10, 12, 14), at the full term. In most cases the mother enjoyed good health during the pregnancy; but in one (12) there was some bleeding, and in another (10) there was grave hysteria during the last month. Sometimes the large size of the abdomen was noted, as in No. 9. In no case was there a record of maternal dropsy or of albuminuria. In one case (16) there was hydramnios, affecting, however, only one amniotic sac, that containing the dropsical fœtus.

In all the cases except two the labour ended in the birth of twins (1, 3, 4, 5, 7, 9, 10, 12, 13, 14, 15, 16, 17, 18, 19); in the two cases, Nos. 2 and 6, it resulted in triplets. In three cases (2, 4, and 19) the dropsical fœtus was born first; in six cases (7, 9, 10, 12, 14, and 15) it was expelled after the normal child; and in the other eight cases it was either said to have been born at the same time, or else no reference was made to the fact at all.

In most cases it was not possible to learn what the presentation was, either because the fœtus was too much deformed, or else because it was very small and escaped notice till the birth of the placenta; but in the case of the specimen described by Tamm and Betschler (9, 10) it was a footling presentation. In most cases the labour was perfectly easy; but in one (10) it was tedious, although not instrumental. The third stage was usually quite normal, and the mother made, as a rule, a speedy recovery. In one case, however, a mole was expelled on the fifth day of the puerperium.

D. Medical History of the Father.—In two cases reference was made to the health of the father: in one (16) it was described as good; in the other (10) it was said that the father was not robust, but still enjoyed good health, and that his mother suffered from cancer. In one instance (7) a woman had healthy infants

by a first husband, and a dropsical and deformed one by her second.

E. Clinical History of the Infant.—In every case the dropsical fœtus was still-born. In some cases (6, 10, 14, 17) the sex of the fœtus was doubtful or not stated; but in six cases (1, 4, 9, 15, 16, 19) it was a female, and in seven instances (2, 3, 5, 7, 12, 13, 18) it was a male. It was usually of the same sex as the normal infant; both were females in Nos. 1, 4, 9, 15, 16, and 19, and both were males in Nos. 3, 5, 12, 13, and 18. In No. 7 the dropsical monster was a male, the normal twin a female. In No. 2, the case of triplets, the morbid fœtus was a male, whilst the healthy infants were a male and a female. In the instances in which the sex of the dropsical fœtus was doubtful, that of the normal infant was in one case (10) masculine, in the other (14) feminine. In several cases the normal twin was born alive (1, 10, 12, 14, 15); in No. 19 it was very small, and lived only three days; in No. 9 it died in labour from the mal-presentation; and in No. 2 the other two fœtuses, although born alive, were not viable.

In the other cases the co-twin was either born dead (3 and 16) or was not viable (18), whilst in Nos. 3, 5, 6, 7, 13, and 17 its fate was not stated.

It will have been gathered from what has been said that the clinical histories differed within very wide limits, and did not present that amount of uniformity met with in the case of mothers of single dropsical fœtuses.

Pathology.

The morbid anatomy of both the fœtus and its placenta and cord has in some cases (3, 8, 9, 16, 18) been already given, and in the other instances the malformations were so numerous that it is not convenient here to state them all; but certain general pathological details may be mentioned.

A. Morbid Anatomy of the Fœtus.

With regard to its *weight* and *size*, the dropsical twin was generally much smaller than the healthy infant; but in a few cases (9, 16, and 18), in all of which it belonged to the variety

paracephalus dipus cardiacus, it was considerably larger. Thus in No. 9, although only a seven months' fœtus, it weighed 8 lbs., and was 33 cms. long; in No. 16 it was larger than the normal twin; and in No. 18 it was three times as large as its twin-brother. In the other specimens the small size of the œdematous twin was due to the gross malformations that existed.

In all the specimens *subcutaneous œdema* was a very marked character. The anasarca was usually general; but in No. 9 it did not affect the lower limbs. In most cases the œdema was described as serous; but in No. 9 it was called gelatinous, and in No. 18 glairy, like white of egg. Sometimes there were cysts containing serum situated on the surface of the skin (4, 7, 15). The great thickness of the subcutaneous tissue was frequently alluded to, and the œdema was described as "enormous," "great," "extraordinary," or "extreme." Friability of the tissues was not noted.

In some cases there were fluid effusions elsewhere in the body. Hydrocephalus was comparatively common (2, 4, 5, 7, and 9), and in Nos. 9 and 16 there was fluid in all the body-cavities. But dropsical collections in the thorax and abdomen were not so common in the twin as in the single fœtus.

With regard to the *pathological appearances of the viscera* the greatest variety existed. In some specimens, as No. 9, nearly all the organs were present; whilst in others, as No. 14, scarcely any were to be found. The cases which deviated least from the normal were the twins of the variety paracephalus dipus cardiacus (5, 6, 7, 9, and 16); whilst the greatest abnormalities were found in the acardiac, acephalic, and amorphous fœtuses (3, 4, 10, 11, 13, 14, 15, and 19). From an etiological point of view the most interesting anomalies were the premature obliteration of the ductus arteriosus in No. 16, and the absence of the thoracic duct and lymphatic vessels in No. 18.

B. Morbid Anatomy of the Placenta.

In the dichorionic twin the placenta was separate, and in one case (17) it was noted that the membranes of the dropsical fœtus alone were œdematous.

In the case of monochorionic twins, one of which was dropsical, there was only one placenta and one chorion. The placenta was

usually described as large, once as elliptical (16), and in the same instance the part of it which nourished the dropsical twin was œdematous. The amniotic sacs were usually separate, and in No. 16 there was excess of liquor amnii in the sac that contained the dropsical fœtus. In the advanced degrees of malformation the relations of the fœtal annexa were not easily made out, acardiac and amorphic fœtuses appearing to be little more than placental parasites.

Anomalies of the umbilical cord were often noted. In No. 5 the cord of the dropsical fœtus seemed to spring from that of the normal one; in No. 10 there was no true cord for the deformed twin at all; there was a cord with one artery and one vein in Nos. 7, 12, and 13; and in Nos. 9 and 15 there was an anastomosis between the vessels of the two cords. In one case also (9) it was specially noted that there were on the umbilical vein three twists containing thrombi, and that signs of phlebitis were present.

Etiology and Pathogenesis.

The causation of general dropsy in a twin is as a rule a simpler matter than that of the same morbid process in a single fœtus. Both the clinical history of the mother and the pathological anatomy of the fœtus lead us to look for a cause not in the maternal but in the fœtal economy. For the clinical histories that have been related contained no notice of any such characteristic group of symptoms as that met with in the case of mothers of a single dropsical fœtus, and the examination of the morbid infant's body usually revealed an adequate structural lesion to account for the dropsy. Further, the fact that one fœtus was dropsical and the other healthy, in itself suggests that the anasarca was not due to any pathological state of the mother, but to some defect in the fœtus or its annexa.

In one group of cases (Nos. 3, 4, 10, 12, 13, 14, 15, 19), that containing such advanced forms of monstrosity as the acardiac, acephalic, mylacephalic, and anidean fœtus, the cause of the anasarca is not difficult to discover. These fœtuses are truly parasites upon the normal infants along with which they are born. The heart of the healthy fœtus has not only to propel the

blood through its own body but also through that of the acardiac parasite; but the circulation in the parasite being the more distant will be carried on with greater difficulty, stasis and exudation will take place, and dropsy of a very advanced degree will soon follow. The absence, therefore, of a heart, at any rate of a functionally active heart, is the cause of the anasarca in these greatly deformed twin fœtuses.

The heart, however, as has been shown, is not always absent or functionally useless in the dropsical twin. In case 9, for instance, the heart was normal. It is necessary, therefore, to look more closely for the cause of the anasarca in such cases. In connexion with his second case of general fœtal dropsy (No. 9) Betschler pointed out that the widespread character of the œdema, the presence of effusions in the body-cavities, and the accompanying malformations, all indicated a very early date of origin and a very deeply established derangement of nutrition. He found that the lumen of the umbilical vein was diminished by the presence in it of thrombi and by the twists that it made round the arteries; there was, therefore, an inevitable restriction of the conveyance of blood to the fœtus, with, as a consequence, dropsy and the various malformations. Betschler thought that the cause of the anomalous condition of the umbilical vein was to be found in the presence of the little connecting vein joining together the umbilical veins of the two fœtuses. Blood flowing from the placenta to the umbilical veins must penetrate into the connecting vein, and that from two opposite directions. "If now these two vessels were of entirely similar character, if they were connected with the corresponding orifices of the communicating vein in an entirely similar way, and especially with quite equal angles, if, further, both orifices lay equally high, if, in a word, these relations on each side quite agreed and corresponded, then the impulse also of the blood rushing from each umbilical vein into this communicating vessel would act with quite equal force, and the blood-waves passing towards its middle point would there experience an obstruction, and would either stagnate or flow back to the parent trunks. Since, however, such a perfect equality of mutual relations could scarcely at any time occur, the impulse of the stream of blood advancing from the side favoured by the difference will overcome

the one encountering it and drive it back into its umbilical vein. . . . In a word, an unequal conveyance of blood to the twins arises, and the one is nourished and developed at the cost of the other." Betschler's explanation no doubt applies also to other cases, *e.g.*, No. 5; but Nieberding found that in his specimen (16) another cause existed. The hypertrophy of the heart, the enlargement and congestion of the kidneys, the dilatation of the bladder, the cavity-dropsies, and the anasarca, he ascribed to early obliteration of the ductus arteriosus due to an increase in its muscular and internal layers. The result of this premature closure would be obstruction in the venous system, an increased flow of blood through the foramen ovale into the left heart, and hypertrophy thereof with increase in the blood-pressure in the arterial system. The venous obstruction would cause the dropsical states, and, through the umbilical vein, œdema of the placenta; whilst the increased arterial pressure due to cardiac hypertrophy would lead to increased filtration through the kidneys, diuresis, with dilatation of the urinary bladder and hydramnios. Whether all the details of Nieberding's explanation are right may be doubted, but it seems probable that the cause of the dropsy was as he stated it.

Smith and Birmingham (18) found yet another explanation of the universal dropsy which existed in their specimen, namely, the absence of the thoracic duct and lymphatics. In their fœtus "every portion of the connexion between the lymph-spaces of the tissues and the venous trunks was absent,—thoracic ducts, lymphatic glands and vessels; the exuded liquor sanguinis possibly, to a slight extent, found its way back to the blood through the agency of the small veins; but if this were the case, the compensation was not sufficient, the exudation went on, the drainage of the spaces was deficient, the spaces became enormously distended, and the result was the aggravated condition of œdema already described." What were the causes of this want of development of the lymphatic system must remain, for the present at least, a mystery.

General dropsy in the twin fœtus may then be ascribed to absence or anomaly of the heart, of part of the vascular system, or of the lymphatic system. Its etiology is essentially fœtal, and

differs from that of dropsy of the single fœtus, which is probably both maternal and fœtal. It would be interesting to analyse the dropsical effusions in twin fœtuses in order to see whether or not they have the chemical characters of obstruction-effusions. From their naked-eye appearances it is probable that they have.

Diagnosis, Prognosis, and Treatment.

Little need be said with regard to the diagnosis, prognosis, and treatment of dropsy in the twin fœtus. It may be possible, during pregnancy, to recognise that there are twins in the uterus, but assuredly the fact that one is dropsical must remain undiscovered till labour is over. When the child is born the condition is very evident, and no one is likely to overlook it if it is borne in mind that such fœtuses often assume most grotesque and unnatural appearances.

For the fœtus itself there is no hope of life; but the other twin is generally healthy and may live; the mother usually recovers rapidly from the effects of labour.

Absolutely nothing can be said with regard to preventive treatment, for we know so little of the origin of the defects which cause dropsy in the twin fœtus. During labour it may be necessary to supplement the natural efforts; but interference will not be so often required here as with the single dropsical infant. If the child be born alive and not gravely deformed, it is possible to imagine that in some cases its life may be prolonged by the use of the incubator, etc.; but no record of such a result has yet been noted.

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CHAPTER XIV.

GENERAL CYSTIC ELEPHANTIASIS OF THE FŒTUS.

DEFINITION; SYNONYMES; HISTORICAL NOTE; CLINICAL HISTORY AND MORBID ANATOMY OF SPECIMEN C.

THERE now falls to be considered a congenital disease which has in all probability a very close connexion with general fœtal dropsy on the one hand, and with such conditions as cystic hygroma of the neck, macroglossa, fibroma molluscum, and congenital sacral tumours on the other. This is the disease which has been termed by some writers *elephantiasis congenita cystica*. The descriptive adjective *cystic* has been given to it to distinguish it from the more solid varieties of congenital elephantiasis, and I have added the words *general* or *universal* to separate it from such localised cystic forms of the disease as macroglossa and congenital hygroma of the neck, the axilla, or of the sacral region.

The various pathological states that have been grouped under the general name of congenital elephantiasis will not be considered here, but will be dealt with in the section of this work including tumours; but since the meaning of the word tumour would have to be stretched beyond reasonable limits in order to include cystic elephantiasis, and for other reasons, it seems appropriate to discuss it here amongst the congenital diseases of the subcutaneous tissue.

Definition.—Elephantiasis congenita cystica universalis may be provisionally defined as a very rare disease of the fœtus, affecting chiefly the subcutaneous tissue, leading to an increase in its dimensions and the formation in it of cysts of various sizes with clear serous or curd-like contents. The disease is one that implicates the subcutaneous tissue all over the body; but it is often very pronounced in a special region—that of the head, for example. Whether it is of the nature of a chronic inflammatory œdema or

of a lymph stasis must in the present state of our knowledge remain uncertain.

Synonymes.—The early writers who described cases of this disease did not, of course, give it the above name. Thus A. Meckel named his specimen a "monstrous mask of a fœtus" (*Monströse Larve eines Fötus*), and Vrolik, who abstracted Meckel's case for his atlas, simply grouped it with another curious affection under the general heading, *cutis formatio præternaturalis.* Otto seems to have met with it only in the cases in which it was complicated by the presence of cervical cystic hygromata; to one of his specimens he attaches the descriptive phase, "fetus humanus anasarca et hygromatis duobus cervicalibus deformatus." It would appear that Virchow regards it as a variety of *elephantiasis congenita mollis*, and a recent observer, Neelsen, has described it under this name. Steinwirker called it *elephantiasis congenita cystica*, and this appellation has been adopted by Everke, Lindfors, and W. R. Wilson; Lindfors, however, gives as a synonym, *hydrops anasarca gelatinosa.* I have thought it well, whilst using the term elephantiasis congenita cystica, to add to it the word *universalis* to limit still further its meaning and to prevent confusion.

Historical Notes.—Whilst many cases of congenital elephantiasis affecting one or other of the regions of the body have been at various times described, the number of specimens of the general cystic variety that have been put on record has been very small. It may be permissible to consider Göller's case as an example of this disease; it was reported in 1683. At any rate Wernher considered it as in every way similar to his second case, which we know to have been a specimen of general congenital cystic elephantiasis. The case described and figured by A. Meckel in 1828 seems to have been the next that was observed, and the two specimens reported by Retzius followed eight years afterwards. In 1841 Otto made an important addition to the number of described cases, for he recorded briefly the morbid anatomy of seven specimens of general anasarca with special cystic accumulations in the cervical region; he also noted two examples in the calf. A. Wernher, in his interesting monograph on *Die Angeborenen Kysten-Hygrome* (1843), gave a full account of this disease in the case of a monstrous fœtus. W. Vrolik incorporated Meckel's

description and plates in his large work entitled *Tabulæ ad illustrandam embryogenesin hominis et mammalium*, published at Amsterdam in 1849. Virchow, in his great work *Die Krankhaften Geschwulste* (1863-65), made several references to the cystic form of congenital elephantiasis mollis, and pointed out its close relationship to macroglossa. Steinwirker's dissertation was published in 1872; but in the previous year A. Jacobi had shown a specimen of this malady to the New York Obstetrical Society, the report of which appeared in the *American Journal of Obstetrics* in 1872. In the same *Journal* Busey in 1877 and 1878 wrote at some length upon "Congenital Occlusion and Dilatation of Lymph Channels," and cited as examples of the condition the specimens of Steinwirker and Meckel. In 1882 F. Neelsen's case was reported, and in 1883 that noted by Carl Everke was published in the form of an inaugural dissertation of Marburg. Lindfors described his specimen in 1890, and W. R. Wilson his in 1891.

I may here narrate the clinical history and give the morbid appearances of a twin fœtus, which I have come to regard as a specimen of general cystic elephantiasis. At first I was inclined to consider it as a case of general anasarca in a twin; but the results of dissection have led me to believe that it is an example of cystic elephantiasis. It has, however, such a strong resemblance to both these morbid states that it may perhaps be necessary to look upon it as the connecting link between them. Further, the similarity which exists between it and the specimens described by Wernher as cervical cystic hygroma suggests also the existence of a close connexion between it and that disease.

On the 4th of May of this year (1892) Prof. A. R. Simpson received from Dr John Edmondson, of Ormskirk in Lancashire, a greatly deformed twin fœtus which was the subject of general cystic elephantiasis. I have to thank Prof. Simpson for the specimen and Dr Edmondson for the clinical notes of the case.

Obstetrical and Clinical History of Dr Edmondson's Case. Specimen C.

The mother was 35 years of age and a vii.-para. She had been married when twenty-three years old, and for some years had

suffered from chronic bronchitis. She was in poor circumstances and of a delicate constitution. Her past pregnancies were six in number; in two of them (the first and fourth) forceps had been required to effect delivery. None of these pregnancies was plural, and save for the use of forceps above noted there was nothing abnormal in the labours.

During her present pregnancy (the seventh) the patient suffered from pain in the right side of the abdomen, which made it very difficult for her to walk. There was also a troublesome amount of chronic bronchitis. Labour came on near the full term, and when Dr Edmondson arrived at the house a perfectly well-formed male infant had been born and its cord tied. The birth was followed by severe hæmorrhage, and there was retention of the placenta. Examination revealed the presence of a second child in utero. Dr Edmondson delivered the placenta of the first child and hooked down what he thought to be the leg of the second infant. The great thickness of the parts above the knee made him doubt the correctness of his diagnosis; but the appearance of a foot at the vulva finally settled the matter. In the meantime the mother was almost pulseless, and further advice was sought. Before, however, the consultant arrived the second child was born. Its placenta was also retained, and in addition it was adherent to the uterus in the upper polar circle. There was, therefore, more hæmorrhage until Dr Edmondson passed his hand in and detached and removed the afterbirth. The time from the birth of the first child to the removal of the placenta of the second was little more than one hour. The first child was born alive, the second was still-born.

On the third day of the puerperium the temperature rose to 100·4; but it fell again on the following day, and the mother did fairly well, although she was weak for a much longer time than she had been after her previous confinements.

Labour took place on January 10th, 1892, and in a letter from Dr Edmondson, dated August 13th, the patient is reported to be well.

The father was a perfectly healthy man. The first twin was perfectly well formed although of small size, he was delicate from the time of birth onwards, and died when four months old from an acute attack of bronchitis.

The mother had two married sisters, of whom one had a family of five children and the other one of six. The patient stated that one sister had died on the ninth day after confinement from inflammation of the womb.

Dr Edmondson thought that the placentæ in this case were separate, and the cords he stated were inserted in the usual position; but as the afterbirths were at once destroyed it was impossible to confirm or to correct this opinion. From the examination of the deformed twin and its cord, however, it became evident, as will be noted immediately, that some vascular connexion must have existed between the two cords and placentæ.

Morbid Anatomy of Specimen C.

A. *External Appearances.* (Plates VII. and VIII.)

The fœtus, a male, had a total length of 28 cms., and the distance from vertex to symphysis pubis was 18 cms. It may be best described as made up of two parts attached to each other in the umbilical region by what may be called a very narrow waist. The upper part consisted of the head, shoulders, and upper limbs; the lower, of the pelvis and lower limbs. In circumference the head measured 33 cms., and the body at the shoulders 32 cms.; but the transverse measurement of the latter was greater than that of the former. The circumference at the point of constriction was only 12 cms., and no bone could be felt in the structure joining together the cephalic and pelvic parts of the fœtus.

In its external appearances this fœtus showed gross malformations (*v.* Plates VII. and VIII.). The skin of the head passed almost directly on to the misshapen arms, and there was, therefore, no trace of a cervical constriction. Then immediately below the shoulder-girdle was the deep constriction already alluded to. The trunk widened out again at the region of the pelvis, and the lower limbs were permanently fixed in a tailor-like position.

In the region of the head it could be seen that the upper part of the cranial vault was absent. Palpation confirmed this, and made it certain that the parietal bones and the frontal were defective, and that there was hydrocephalus. Some scattered hairs were to be seen, lying principally at the sides of the

General Cystic Elephantiasis, Case C, ($\frac{1}{2}$ Nat. Size.)

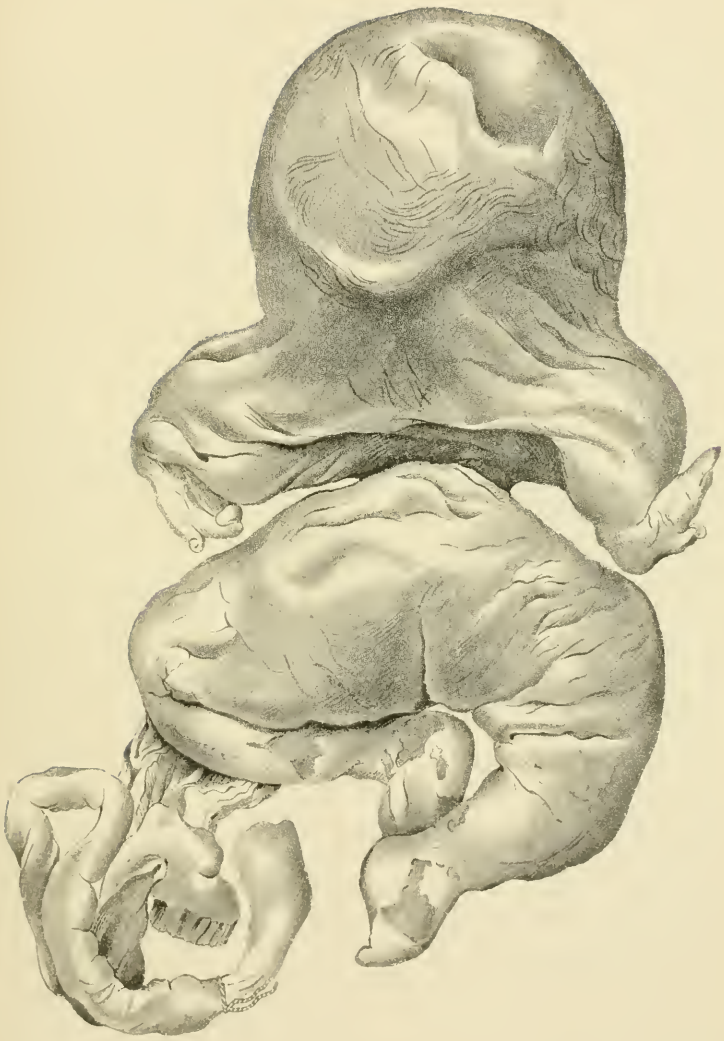
head and coming forward somewhat in the manner of whiskers. At the nape of the neck and sides of the head at about the level of the mouth the subcutaneous tissues felt thick, elastic, and soft, and at one or two places the feeling of fluctuation could be elicited. The face was greatly deformed. There was no nasal projection, but in its place existed a linear depression lying between two blind pits which represented the nostrils. On each side of this very rudimentary nose lay an eye-aperture with twisted and defective eyelids. The orbit on the left side was larger than that on the right. No properly formed eyeball could be detected. The eyes were at the same level as the nasal pits and in close apposition to them. At a distance of nearly 2 cms. below these structures was situated the mouth, in which could be seen a small tongue. On opening the mouth it was discovered that there was a fissure in the median line of the palate with a bifid uvula. Below the buccal aperture was the indication of a chin. On the left side, at a distance of 3 cms. from the angle of the mouth and at the level of the chin, was a blind pit which probably represented the left external ear. On the right side, at the same level, but at a distance of 3·5 cms. from the angle of the mouth, was a button-like projection of skin measuring about 1 cm. in diameter and having at its centre another blind pit. This was the representative of the right auricle. Above and behind this structure were two little cutaneous vesicles.

In the region of the neck and shoulder-girdle the skin lay in folds, and on palpation a greatly thickened soft subcutaneous tissue layer could be made out. So thick was this layer that the bones of the arms could scarcely be felt. The skin and subcutaneous cellular tissue of the head passed like a cape on to the arms, leaving only the hands free. The thumb and index finger were absent on both sides and the hands were clubbed. Nails were seen on the digits. On the anterior aspect of the constricted part of the trunk was found a ruptured umbilical hernial sac. This contained a few coils of intestine. These were closely adherent to each other and to the wall of the sac at its upper part. At the neck of the sac inferiorly were one or two slender adhesions passing to the intestinal coils. A cæcum could be distinguished with an appendix vermiformis about 1·3 cm. in length, and the

coils of gut were probably representatives of the colon. As has been already stated, no osseous tissue was to be felt at the point of constriction, showing that no vertebral column there existed.

In the region of the pelvic girdle were seen a penis and scrotum, but no testicles could be felt in the latter. Posteriorly there was a patent anal aperture lying deeply between the buttocks. The subcutaneous tissue in this region seemed to form a very thick layer and was markedly soft in consistence. The lower limbs could not be straightened out, but were fixed in their abnormal position. The feet were clubbed: on the right there were three separate toes, but one of these was evidently made up of three fused together; on the left foot were three toes. There were abrasions of the cuticle on some parts of the lower limbs, and these were especially marked on the feet, both on the sole and on the dorsal surface. There was a tear in the soft structures of the left leg just below the knee; this had probably been caused by traction during delivery. Numerous furrows in the skin existed all over the lower limbs, but especially on their posterior aspect. As was the case with the arms, the subcutaneous tissue of the legs felt greatly thickened and soft.

In the absence of the afterbirth nothing could be said of its appearances, but a considerable part of the umbilical cord was attached to the body of the fœtus and could be examined. Its total length was about 48 cms. On close inspection it became evident that it consisted of two parts. The distal portion resembled a normal umbilical cord, it was 32 cms. in length, was tied about 5 cms. from its free end, and had a circumference of about 4 cms. It contained two arteries and one vein lying in a normal quantity of the jelly of Wharton. As it was traced towards the fœtus it was found that it ended at a point about 16 cms. distant from the umbilicus in a disc of tissue that resembled the wall of a blood sac, or part of the amnion with a thin layer of placental tissue attached. Here the torn ends of the vessels were seen. In the other part of this disc were found the torn ends of two vessels, an artery and a vein. These could be traced running in the membranes, which formed the remaining 16 cms. of the cord, to the umbilicus of the fœtus, into which they passed. There was, therefore, no properly formed cord



General Cystic Elephantiasis, Case C, Posterior Aspect. ($\frac{1}{2}$ Nat. Size.)

between the disc of tissue and the fœtus, only two small vessels lying in the membranes. Probably these vessels came from the cord or placenta of the normal twin.

B. *Dissectional Appearances.*

When the scalp and thickened cerebral membranes were divided it was found that there was an enormous accumulation of clear fluid in the position of the lateral ventricles. The falx cerebri intervened between the fluid accumulations above, but inferiorly they communicated. Part of the frontal lobes, a thin layer of cerebral tissue laterally, a greatly macerated pons varolii inferiorly, and a normal looking cerebellum inferiorly and posteriorly, were the only parts of the nervous system that could be recognised. When these structures were removed no trace of a foramen magnum could be discovered; the four component parts of the occiput lay in close contact with each other.

When the skin was reflected at the back and sides of the head several cavities containing clear fluid were revealed. Two of these were of the size of a large walnut, and lay one on each side of the middle line just behind the occipital bone in the subcutaneous tissue which was here much thickened. Two similar cysts, also with clear fluid contents, lay one on each side just behind the spot where the rudimentary ear pit was visible on the skin surface. Besides fluid these cystic cavities, which had a smooth shining lining membrane, also contained soft, curdy, yellowish-white masses. One or two smaller cysts were found lying between those that have been already mentioned. The presence of fluctuation in the region of the neck was thus accounted for.

There was no thoracic cavity. It was found, on cutting down in the middle line of the neck, that there was a larynx and trachea measuring about 7 cms. in length, and terminating blindly just above the umbilical hernial sac. The larynx opened into the back of the mouth. There was no trace of an œsophagus. No structures resembling a heart and lungs could be found, and the sternum and ribs were also absent.

The scapula and clavicle were very rudimentary, and the former seemed to consist of nothing more than the glenoid cavity with a small scale of bone attached thereto. The subcutaneous tissue

of the arm formed a layer 2·5 cms. in thickness, and was composed of whitish, glistening, and densely infiltrated tissue. From it a clear serous fluid oozed out on pressure. No cysts could be seen in it with the naked eye. The humerus measured 5·5 cms. in length and was straight; the ulna had a length of 3 cms.; there was no radius; a cartilaginous carpus was present, and there were three metacarpal bones along with their phalanges. The elbow joint was anchylosed and so was the wrist; the carpus was articulated at a right angle to the lower end of the ulna, giving rise to the club hand. The above were the conditions found on dissection of the left arm. With regard to the musculature, it seemed as if it were represented only by bands of fat-like tissue running in various directions immediately beneath the subcutaneous tissue.

There was no abdominal cavity properly so called, for the coils of intestine were all densely adherent to each other and to the surrounding parts. On tracing the bowel inwards from the hernial sac, it was found that a loop of it, like the sigmoid flexure, passed downwards, and ended in a part which became continuous with the rectum. For a probe passed up through the anal aperture could be felt in the loop of bowel above mentioned, and the fact was also ascertained by dissection. The intestines contained a small quantity of a dirty-white porridgy material. The whole bowel measured only 25 cms. in length when its adhesions were divided, and it was separated from its short and contracted mesentery. There was no stomach, liver, spleen, kidneys, and supra-renal capsules; but four small bodies were found in close connexion with the intestine, and these may have represented some of the missing viscera. One of these was 1 cm. in length and 5 mms. broad; it lay in the curve formed by the cæcum and was adherent to it. The three other bodies lay near to each other and were also bound to the coils of bowel; one was 1·5 cm. in length, another 8 mms., and the smallest 3 mms. The largest was somewhat round in shape and the smaller ones were flattened. The urinary bladder was present; it was small in size, and lay in its normal position in front of the rectum. A urethra passed from the bladder through the penis, and there was a prostate gland. No sign of the existence of testicles was found. There was no connexion between the rectum and the bladder.

At the point of the body where the defective umbilical cord was inserted, the single umbilical artery broke up into two branches. One of these passed upwards to the neck, where it again subdivided into arteries for the head and upper limbs; the largest of these subdivisions were the two that passed up to the head, lying one on each side of the larynx and trachea. The other primary branch proceeded downwards to supply the pelvis and lower limbs. The umbilical vein also divided into two trunks, and these had a distribution similar to that of the arteries.

There was no trace whatever of a vertebral column. The head lay simply upon the shoulders, and could be separated from them without the division of any osseous or cartilaginous vertebræ. There was no sacrum or coccyx; the two innominate bones, which showed about the same degree of ossification as is usually met with at birth, came into contact in the middle line posteriorly and anteriorly, and formed a rudimentary pelvic cavity. The femur measured 6·5 cms. in length; it was straight and narrow. Both tibia and fibula were present, the former was 6 and the latter 5 cms. in length. The knee-joint was anchylosed in a flexed position. The feet have been already described. The subcutaneous œdematous tissue in the case of the left thigh had a thickness of from 1·5 to 1 cm., and here and there in it small pea-sized cysts could be seen.

C. *Microscopic Appearances.*

Both the microscopical investigation of the tissues and the chemical examination of the cyst contents were rendered unsatisfactory in this case, for the specimen had been kept in preserving fluid for four months before it was sent to Professor Simpson and handed over to me.

Several sections of skin and subcutaneous tissue from the thigh, arm, and head were examined microscopically, and in those from the first two situations the three layers—cutis, subcutaneous tissue, and musculature—were clearly recognisable. The epidermis with a thin coating of vernix caseosa was present at most places, but here and there it was detached. The cutis had an opened out appearance, but its fibres seemed normal in size and did not appear to be increased in number. Here and there hair follicles, hairs,

and rudimentary sweat glands were to be seen. The subcutaneous tissue formed a thick layer of a delicate areolar tissue, containing in its meshwork no fat cells, but simply clear open spaces with polygonal outlines. These no doubt were filled with the clear watery fluid which exuded from the cut surface of the tissue. There were scarcely any bloodvessels to be seen either in the cutis or in the underlying areolar layer. Beneath the subcutaneous tissue was the representative of the muscular layer. Hardly any muscle bundles were to be made out,—they seemed to have been replaced to a large extent by adipose tissue, and beneath them lay the periosteum and the bone of the part.

A section of the wall of one of the large cysts at the back of the neck showed a fibrous structure, but no endo- or epithelial lining could be made out. Microscopical and chemical examination of the cyst contents gave unsatisfactory results; only a few broken down cells and masses of granular debris could be seen.

The investigation of the little gland-like bodies found in the neighbourhood of the intestine revealed the following appearances. The largest of these bodies showed the microscopic structure of the liver at an early stage of development. The second in size, that which lay near the cæcum, was found to be a separate loop of bowel, and showed in its interior some crypts of Lieberkühn. The larger of the other two bodies had an appearance somewhat resembling that of the spleen, and the smaller showed tissue not unlike that seen in the kidney in early fœtal life. These structures, like the skin and subcutaneous tissue, were markedly anæmic.

From the morbid anatomy of this specimen it may be concluded that the fœtus was an omphalo-angiopagous twin of the variety paracephalus dipus acardiacus, and that it was the subject of what has been called general cystic elephantiasis.

CHAPTER XV.

GENERAL CYSTIC ELEPHANTIASIS OF THE FŒTUS—Continued.

CLINICAL HISTORY; PATHOLOGY.

In the preceding chapter the clinical history and morbid anatomy of the only case of general fœtal cystic elephantiasis that I have seen were given; and it is now necessary to pass in review the obstetrical and medical details that were given, and the pathological appearances that were found by the other writers who have met with specimens of this disease. I have gathered together some eighteen cases reported by eleven observers, and shall hereafter refer to them by numbers corresponding to those in the bibliographical list found at the end of Chapter XVI. I have in every case but one (No. 3) been able to consult the original publications. My own specimen will be referred to as No. 15.

Clinical History.

In only a few cases of general cystic elephantiasis was the anamnesis given with any degree of fulness: that was in Nos. 11, 13, and 14, and in Dr Edmondson's case reported by me (15).

The *age of the mother* when she gave birth to the morbid fœtus was seldom stated: it was 31 years in No. 13, and 35 in No. 15.

With regard to her *previous health*, it was stated in No. 5 that she had always been strong and well; in No. 14 there was no history of tubercular or specific disease; and in No. 13 it was recorded that the mother was of medium size, a well-built, well-nourished blonde, and that, although often sickly, she had never had a serious illness. She had, however, suffered from her youth from scrofulous eczema and ophthalmia in No. 11; and in No. 15

it was stated that she was of delicate constitution, lived in poor circumstances, and was affected with chronic bronchitis.

Sexual History of the Mother.—In one case (14) it was noted that the menses had first appeared at the age of 15, and had been regular as to type and habit; and in another instance (15) the menstrual history was good. The mother was ii.-para in No. 14, a iii.-para in No. 13, a vii.-para in No. 15, and a xii.-para in No. 11. She was a multipara in No. 5. In No. 14 the previous pregnancy had resulted in the birth at term of a healthy child, who was now two and a half years old; the labour was normal; and there was no history of abortions. Both the past gestations had ended in the birth of well-formed infants in No. 13, and the mother had nursed on these occasions. In No. 15, two of the six previous labours had been instrumental (forceps), and none had been plural in character. Of the eleven pregnancies in No. 11, one had ended in an abortion, two of the children had died some time after birth from diphtheria, and the remaining eight were still alive, but all showed signs of scrofula (ophthalmia, eczema, otorrhœa, and otitis media with perforation of the tympanum).

The pregnancy which resulted in the birth of a fœtus with cystic elephantiasis usually terminated prematurely at the fourth month (3 (*a* and *b*), 4 (*g*)); at the fourth or fifth month (9); at the fifth month (4 (*a*, *b*, *c*)); at the fifth or sixth month (11); at the sixth (2, 4 (*d*)); at the sixth or seventh (13); at the seventh (1, 4 (*e* and *f*)); at the eighth (12 and 14); and near the full term (15). In some cases the pregnancy was plural; twins in Nos. 4 *f* and 15; triplets in Nos. 1 and 5. In some of the others it may also have been plural, but the fact was not stated.

The health of the mother during pregnancy was occasionally referred to: in No. 11, about three or four weeks before delivery, marked œdema of the lower limbs appeared along with uræmic phenomena, the urine became albuminous but showed no tube-casts, and all these symptoms diminished somewhat under the appropriate treatment; in No. 13 the first months were uneventful, but later œdema of the feet appeared, and the patient felt uncomfortable and more swollen than usual; an abnormal degree of abdominal distension was noted at the beginning of the third month in No. 14, and at the time of confinement (eighth month)

the circumference of the abdomen was 104 cms., no fœtal heart could be heard, and the position of the child could not be made out, hydramnios was diagnosed, the urine was normal in quantity and not albuminous; hydramnios was also present in No. 4 *g;* and in No. 15 the patient suffered during pregnancy from pain in the right side of the abdomen, making walking difficult, and there was a troublesome amount of chronic bronchitis.

Only in two or three cases were the characters of the confinement detailed: it was precipitate in No. 11, and the child was dead, and had been so for probably eight days previously; in No. 13 there was a footling presentation, labour was delayed, but was ultimately effected by traction on the limbs, and the child was dead but not macerated; the confinement was natural in No. 14; and in No. 15 (twins) the birth of the healthy fœtus was normal, but that of the diseased one (footling presentation) was delayed, and labour was only completed after considerable traction had been made. In No. 1 three female fœtuses were born; the first was normal, the second was diseased and monstrous, and the third was healthy. The second was expelled wrapt up in the membranes. The placenta was expelled spontaneously and without hæmorrhage in No. 13; but there was great bleeding and placental retention in No. 15. The puerperium was quite normal in No. 13; but the recovery was tedious and accompanied by febrile symptoms in No. 15. In the last-mentioned case the mother remained healthy after the puerperium.

With regard to the *medical history of the father* no information is usually given. He was a healthy man in No. 15.

Clinical History of the Infant.—In only two of the cases that I have gathered together did the infant live after birth—for thirty minutes in No. 14, and for twenty months in No. 8—in all the other instances it was still-born or had died in utero. Since labour usually came on prematurely, this result was what might be expected. With regard to its sex, it was a female in Nos. 1, 3, 4 (*a, b, c, d, e, f,* and *g*), and 12; and a male in Nos. 2, 5, 9, 13, and 15. In the twin and triplet cases the fœtuses were of the same sex; they were both males in No. 15, and they were all three females in No. 1. The infant born along with the diseased child

was delicate and of small size in No. 15, and died at the fourth month from an attack of bronchitis.

Pathology.

The morbid anatomy of the fœtus and placenta must now be considered. In No. 8 no dissection was possible, for the child was alive at the time when the case was reported; but in all the other instances complete autopsies were carried out. The placenta was seldom closely examined.

A. Morbid Anatomy of the Fœtus.

I. *Macroscopic Characters.*

The *length* and *weight* of the fœtus were usually greater than they ought to have been for the age arrived at; but in the twin and triplet cases the anomalies in structure were so great as to curtail considerably the dimensions. The fœtus was 10 inches long in No. 5; it was 18¼ cms. in length and weighed 250 grammes in No. 9; it measured 27 cms. in Neelsen's case (11); it weighed 1662 grammes and had a length of 31 cms. in No. 12; Lindfors' specimen had a weight of about 1400 grammes and a total length of 34 cms. (13); and the infant in Wilson's case (14) was 40 cms. long and weighed 5½ lbs. It will be remembered that the specimen described by me had a total length of 28 cms. (15).

The two most constant and most evident features of this disease were the presence of *general anasarca* and the existence of *cystic accumulations* in the *subcutaneous tissue*. The bizarre appearance of the specimens was in great part due to the above mentioned changes in the connective tissue layer under the skin. In the case of the fœtuses from plural conceptions, other deformities helped to render them monstrous to an extreme degree.

In Göller's case (1) the fœtus had not the human form at all, whether viewed from the front or from behind; the head had a pyramidal form; there was no indication of a cervical constriction, and so the face appeared to rest directly upon the thorax; the cranial tumour descended on to the neck like a monk's hood; the eyes, ears, and nose were rudimentary; the anus

Fig. 1.

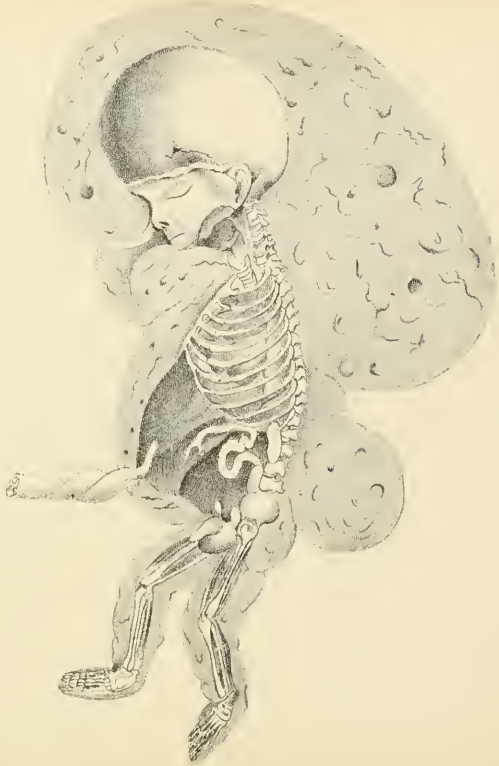


Fig. 2.

Meckel's Specimen of Cystic Elephantiasis.

was imperforate; the right arm was longer and larger than the left, and the converse was the case with the legs; there was only one digit on each extremity; and whilst there was an increase in the subcutaneous tissue all over the body, there were cystic accumulations in it at the back and on the top of the head. From its external appearances we may consider this specimen as a fœtus paracephalus dipus, and dissection revealed that it belonged to the acardiac variety of that type of monstrosity.

Specimen No. 2 (Plate IX., figs. 1 and 2) showed so little of the human form that Meckel used to exhibit it with lions', elephants', and calves' heads as an example of what the older writers called molæ spuriæ, and he considered it to be an acephalus. There was externally no proper head to be seen, but only a fleshy, spongy tumour which stretched down in front as far as the breast. Meckel made a section through this tumour, and was greatly surprised to find underneath it a well-formed fœtal face, which had been hidden by the fleshy mass as the glans penis is concealed by the foreskin. He felt like the child who sees a man masked like a bear throw away the mask and reveal his face. The skin of the face, ears, and tips of the fingers and toes was fine and smooth; that on the rest of the body showed a partial opening out of its tissue with an increase in its elements. It formed a jelly-like layer, about 2 inches thick, which showed numerous cavities, some empty and collapsed, others still partly filled with lymph. At the tips of the fingers and toes the transition from the normal into the abnormal was imperceptible; but on the face there was a sharply marked boundary line which passed over the lower part of the forehead up to the ear, then beneath the latter downwards and forwards close above the lower jaw, and around the eyes and the orifice of the mouth. At all these points the very fine skin was suddenly converted into the enormously thick mask-like covering. The swelling of the skin decreased, as a general rule, as one passed from the upper to the lower parts of the body. The largest projections were found on the head and in the lumbar region.

In both the embryos described by Retzius (3) the whole skin was dropsical and formed numerous folds, under which lay a number of large cysts filled with clear fluid. In all Otto's speci-

mens (4, *a*, *b*, *c*, *d*, *e*, *f*, *g*) there was universal anasarca, and in all there were two large cysts with clear contents lying behind the head and neck. In one (*d*) there was hare-lip and cleft-palate, and in two (*e* and *f*) the limbs were short.

Wernher's specimen (5) was a greatly deformed fœtus from a case of triplets, and closely resembled Göller's (*v.* Plate X.). The head was pyramidal in form, and was widest just above the shoulders. It rested immediately upon the thorax, and there was no indication of a neck, for the skin of the chin passed directly on to that of the chest. On the outer sides of the deformed ears there were two large sack-like projections of skin, upon which the head rested as upon a cushion. The right eye was rudimentary, whilst the left was absent, and there was a deformed nose. The right arm was attached directly in its upper half to the chest-wall by a fold of skin, and its fingers were normal in number and form, but were somewhat contracted. The left arm was stunted, it was much shorter and thinner than the right, and possessed only three toes. Under the thorax the trunk diminished rapidly in size and ended in one lower extremity (the right), which had only four toes. The left leg was absent. The penis with its prepuce was well marked, the scrotum was small and empty, and there was no trace of an anal aperture. The skin over the whole body was infiltrated with fluid, and showed a number of wrinkles and folds which were specially marked on the posterior aspect of the trunk. An incision in the region of the nape of the neck revealed the presence of a number of thin walled cysts of varying size, which were completely shut off from one another. Some were the size of a pigeon's egg, others that of a hazel nut. All were lined with a serous-like membrane, and contained a muddy lymph. The skin covering these cysts showed no adipose tissue, but was infiltrated with much watery fluid. Under the folds of skin over the rest of the body were similar cysts.

The child described by Jacobi (8) showed at the time of birth a tumour, the size of the two fists, extending from the lower part of the occipital bone to the spines of the scapulæ. No fresh swellings appeared after birth, and the above-mentioned tumour gradually diminished in size, so that at the age of twenty months only one-fourth or one-fifth of the whole mass remained. The left forearm

Wernher's Specimen of Cystic Elephantiasis. ($\frac{2}{3}$ Nat. Size.)

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and the hand were thicker than those on the right side. The calves, especially the left, were also thicker and harder than is normal. The child was otherwise well developed.

Steinwirker described the appearances of his specimen very fully (No. 9), (*vide* Plate XI. fig. 1). The thorax, abdomen, and limbs were well formed, but their skin-covering was a thickened, markedly soft mass, showing numerous rumples and folds which were specially well developed in the region of the thorax, so that that region of the body had a circumference of 14 cms. A tumour was seen covering the whole of the cranial vault as well as a large part of the face and neck. It stretched like a cape from the top of the shoulders over the nape of the neck and vault of the cranium as far as the root of the nose; from this point it passed on both sides, with a curve convex to the front, to the outer corner of the eye, to the angle of the mouth, and to the chin, and returned along the neck to the upper border of the scapulæ. At the top of the forehead the tumour had a circumference of 18 cms., and from one corner of the mouth to the other it measured 15 cms. Its extent in the direction of the sagittal suture was 16 cms., that from the root of the nose to the vertex was 6 cms., and that from the back to the vertex 10 cms. At its boundaries the mass could be to some extent lifted up and drawn off from the underlying parts, especially on the scapulæ, neck, and forehead. It was divided into a number of lobes by deep furrows; and frontal, temporal, facial, and cervical parts could be thus distinguished. In the furrow separating the facial from the cervical lobe the external ear could be recognised. It seemed that a furrow had passed in the line of the sagittal suture over the whole length of the tumour, dividing it into symmetrical halves; but from the way in which the section had been made this furrow was no longer visible. In depth the tumour varied from 2 to 8 mms., and a section right down to the bone in the parietal region was smaller than a similar one on the forehead or nape of the neck. Numerous small spaces appeared on the cut surface, especially at the back of the head and in the frontal region; some of these reached the size of a pin's head. The upper and lower jaws, the lips, the hard palate, tongue, and floor of the buccal cavity showed no abnormality save some degree of tumefaction of the lips.

Neelsen also gave a very complete description of the specimen of cystic elephantiasis which came into his hands (11); it was unfortunately somewhat macerated (*vide* Plate XI., fig. 2). In its external appearances the fœtus was much deformed, for the several segments of the limbs, the various parts of the face and head, and also, although to a less degree, the whole trunk showed cystic formations. Neelsen was led to compare the fœtus to the plum mannikins of the Christmas markets in Germany. To the thick unjointed body, which was about the size of a large apple, were attached the peculiarly crooked short limbs, each of which consisted of three rounded segments varying in size from that of a plum to that of a cherry. The whole was surmounted by the neckless deformed head, showing marked projections of the forehead and cheeks, between which disappeared, as in a hollow, the eyes, mouth, and nose. Posteriorly there was attached to the head a chignon-like tumour hanging down over the nape of the neck. In the fresh state the surface had a shining appearance and a slightly fluctuating character; but after hardening, the parts had the consistence of a fresh fatty liver and the surface was somewhat wrinkled. The skin was in most parts of the body deprived of its epidermis, and the exposed cutis had a grayish-brown colour, which had been red when fresh. The remains of the hair follicles appeared on the surface like little pits, and the whole skin resembled the leather used for kid-gloves. In the grooves between the folds pieces of epidermis could still be found, some still firmly fixed, others as half detached scales. Whilst the greater part of the body-surface was transformed into a soft pulpy mass, the palms of the hands, the soles of the feet, and the tips of the fingers and toes showed a perfectly normal thin skin.

Everke's specimen (12) seems to have closely resembled that just described. The head circumference was 29 cms., whilst the transverse diameter was 7·5 cms., the antero-posterior 9·6 cms., and the diagonal 10 cms. On the nape of the neck lay a large sack-like appendage with a broad basis. The circumference of the neck over the tumour was 22 cms. The distance from the external occipital protuberance to the anus passing over the tumour was 24 cms. The soft parts of the face were so prominent that the nose and eyes were concealed by the projecting swellings

Fig. 1.

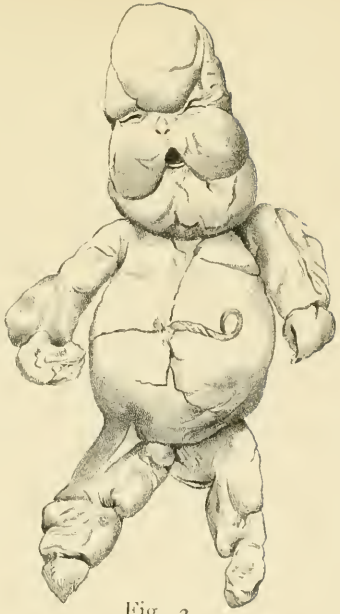

Fig. 2.

Cystic Elephantiasis.

Fig. 1. Steinwirker's Specimen.

Fig. 2. Neelsen's Specimen.

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on the cheeks and forehead. The abdomen was markedly distended, and had a circumference of 32 cms. at the level of the umbilicus. The skin everywhere was thick. The limbs were short, the left foot was clubbed, and its little toe was isolated from the others and projected outwards. The tissues around the umbilicus, in an area of about the size of a five-mark piece, felt hard and were much thickened. There was a fibro-myxomatous stratum, 6 mms. in thickness, lying between the skin and the musculature; its presence was the cause of the hardness and, to some extent, of the prominence of the abdominal wall near the navel. There was marked thickening of the skin of the head. An incision made into the tumour on the back of the neck opened into six smooth-walled cysts; from these a brownish-yellow non-transparent material mixed with brownish fragments flowed out. The cysts which lay near the middle line were larger than those situated peripherally,—their size varied from that of a pigeon's egg to that of a small cherry. Some of the cysts communicated with each other by small openings, but none of them had any connexion with the vertebral canal or its contents. There was no hernia cerebri.

Lindfors gives a very graphic account of the external appearances of his specimen. It lay, he said, on a kitchen plate as a fleshy, red, gelatinous, vibrating mass, which at first sight showed only an enormous head and small webbed extremities. When stretched out it measured 34 cms.; it had a cephalic circumference of 38 cms., and a thoracic of 24 cms.; and it weighed more than 1400 grammes. There was an umbilical hernia of about the size of a large hen's egg. An amniotic band was attached to the back of the left hand. The entire skin was glistening, red, tensely stretched, œdematous, soft, and vibrating like gelatin; it was also very friable, and was torn at several places, *e.g.*, the front of the neck and the left inguinal region. It was here and there puffed up, and on the head there were four flap like protuberances. The anterior and the two lateral flaps had a fairly firm consistence; but the enormous occipital lobe, which hung down the back like a cape, was soft and elastic like a bladder filled with water. The four lobes or flaps were separated from each other by shallow grooves. The eyes and ears were well developed, but the nose

was represented only by two small openings. The bones of the digits were separate, but the fingers and toes were bound together by skin; the nails were indicated.

When an incision was made into the brow-lobe of the head tumour, it was found to be composed of skin and subcutaneous cellular tissue. In thickness it measured from 14 to 15 mms., and on the cut surface numerous small clefts or cavities could be seen. The large occipital tumour, on the other hand, was a cyst with serous contents and with a wall only 2 or 3 mms. thick. The sac was lined by a very fine membrane, which sent off a septum in the sagittal direction, dividing the entire cyst into two compartments. No communication could be found between the interior of the cranium and the cyst cavity.

W. R. Wilson's specimen (14) was 40 cms. in length, and had a head circumference of 33 cms. Beneath the right arm there was an elastic fluctuating tumour extending from axilla to ilium, which increased the thoracic circumference to 38·5 cms. The surface of this tumour was smooth, and was marked here and there by superficial furrows, which corresponded to the septa between the cysts composing the growth. Some of the cysts contained fluid, others colloid material. In the left lumbar region was a tumour of similar consistence; and small elastic apparently cystic growths covered the extensor surface of the arms and the dorsal aspect of the fingers and toes. The left thigh and the upper part of the right were enlarged from a hyperplasia of the connective tissue. The left thigh measured 17·5 cms. in circumference, and showed at places sessile cystic tumours in addition to the hyperplastic changes. There was a deep reddish discoloration of the skin of the lower limbs, ascribed by Wilson to arterial and venous ectasy. The external appearances of the fœtus and the changes in its subcutaneous tissues have been already described in the case of No. 15. It resembled most closely the specimens of Göller and Wernher, for it was like them a paracephalian monstrosity from a plural pregnancy.

Such were the external appearances of the recorded specimens of general cystic elephantiasis, and such were the naked-eye characters of the subcutaneous tissue and skin. It is now necessary to look at the condition of the body-cavities and internal organs.

With regard to the body-cavities, there was fluid in both abdomen and thorax in Nos. 1, 4 (*f*), and 13; whilst in Nos. 9, 11, and 15 there was not. In No. 12 some fluid, rendered slightly muddy by maceration, was to be found in the peritoneal cavity, and in No. 4 (*e*) there was peritonitic effusion in the abdomen. In No. 4 (*d*) and in 15 there was hydrocephalus.

The *state of the internal organs* varied within wide limits. In Steinwirker's case (9) and in Wilson's (14) the viscera showed no abnormality. In Neelsen's case also (11) the internal organs showed only comparatively slight anomalies: the liver and spleen were larger than normal; the kidneys were markedly lobulated; the adrenals, bladder, urachus, and umbilical vein were all healthy; the lungs did not contain any air; and the heart and great vessels, both arterial and venous, were not in any way abnormal. Neelsen regretted that he could not speak with regard to the state of the thoracic duct. The skeleton was well formed as a whole; but there was an osteophytic outgrowth on the supra-occiput under the chignon-like tumour. In the specimen described by Meckel (2) the skeleton was normal in form, but the bones were very thin and cartilaginous; the cæcum still lay close beneath the liver; and the suprarenal capsules were absent. The internal organs do not seem to have been markedly abnormal in Otto's cases; thus in No. 4 (*d*) there was no anomaly save hydrocephalus; in No. 4 (*f*) there was rachitis, the limbs were short, and the viscera were small; and in No. 4 (*e*) the intestine was short and the extremities stunted.

In Everke's case (12), whilst the thoracic organs were normally formed, those in the abdomen showed pathological alterations. The intestine was much contracted, and was closely bound to the spinal column by the short, thick mesentery; it occupied a space equal in size to a walnut. The liver had a rounded shape, and the suspensory ligament was very short and had the appearance of a broad fibrous band. The spleen was large. There was no utero-vesical pouch of peritoneum; for the uterus, tubes, and ovaries were bound firmly to the anterior abdominal wall. The round ligaments did not exist. The rectum, kidneys, ureters, and the great vessels and nerves of the abdomen showed no pathological changes.

Lindfors described some important visceral alterations in his specimen (No. 13). There was an umbilical hernia, containing some coils of intestine and part of the right lobe of the liver. A communication reaching the entire length of the pericardial sac was found between it and the left pleural cavity. The left auricle lay in the cleft with its end projecting into the pleural sac. The heart showed a common ventricle, and a common auriculo-ventricular opening; the auricles were very incompletely separated from one another.

In Nos. 1, 5, and 15 the changes found in the internal organs were very extensive, and in this respect, as well as in others, these three specimens formed a group by themselves. In Göller's specimen the heart and lungs were absent, and the trachea ended blindly at the level of the first rib in a small sac containing air. The œsophagus, stomach, liver, and spleen were wanting. The vena cava formed a plexus, like that of the portal vein, which ended above in the subclavian and jugular, and below in the renal and iliac, veins; it communicated with the aorta, which sent upwards the subclavian artery and downwards the iliac. From the subclavian arose the carotids. The intestine was very imperfect. The kidneys showed sinuous cavities in their interior, and the uterus was bicornate.

In No. 5 (Wernher's specimen) the lungs, heart, thymus, and œsophagus were absent, and the thoracic cavity was filled with serous connective tissue. An artery and a vein lay near the spinal column, and sent off a few twigs. No regular diaphragm was found. The abdominal cavity was very small, but was lined with serous membrane; it contained a coil of intestine, which sent off into the pelvis a continuation with a blind end. Part of the intestine had a distinct mesentery, and at about its middle point there was a diverticular appendage. Near the lower end of the bowel was a small space, which was probably a rudimentary bladder. The liver, spleen, and stomach were absent; but there were two kidneys and adrenals. Near the right kidney was a glandular body, probably a testicle. There was only one umbilical artery, the right.

The conditions found in Dr Edmondson's specimen (15) very closely resembled those detailed above. Whilst Nos. 1 and 15

were examples of the fœtus paracephalus *dipus* acardiacus, No. 5 differed from them in possessing only one lower extremity (fœtus paracephalus monopus acardiacus).

II. *Microscopic Characters.*

Steinwirker, Neelsen, and Wilson gave complete details of the microscopic appearances of the skin and subcutaneous tissue in their specimens; but Wernher, Everke, and Lindfors only supplied brief notes on this matter.

Wernher (5) described the walls of the cysts as made up of bundles of fibres, and recognised in their fluid contents many separate epithelial cells.

Steinwirker (9) found that the tumour on the head of the fœtus had its origin in the cutis and subcutaneous tissue; that it reached down as far as the musculature; and that it consisted chiefly of a connective tissue rich in cells, permeated with vessels, and of varying consistence. The cells were chiefly spindle and stellate in form, and had round cells lying between them. The fibres of the primary substance of the connective tissue had a more sinuous course in the cervical part of the tumour, and were interwoven in different directions so as to form a compact felt, interrupted only by scanty irregularly formed fissures. On the vertex of the head and in the frontal part of the tumour the fibres ran chiefly in straight lines and formed a looser network.

The bloodvessels were most numerous in the parietal part of the tumour, and were filled with discoloured brownish-yellow blood corpuscles. They exhibited numerous turnings and many varicose swellings. The vessels in the cervical and frontal regions were less numerous, but were still markedly in excess of the normal. The spaces were also most numerous and largest in the parietal part of the tumour, and had a roundish or polygonal shape. They were chiefly empty, but some contained a fine-fibred clot enclosing lymph corpuscles. Their walls were formed by a consolidation of the loose connective tissue of the tumour, and showed in many places traces of an endothelial covering. The spaces in the cervical region were on the whole fewer in number and smaller, and were also for the most part empty, but some contained a few separate lymph corpuscles. In the frontal region the spaces were

indeed more numerous, but they were not, as a rule, so large as in the parietal regions; they usually contained a few lymph cells or masses of detritus; in places they were filled with colloid material. In the cervical and frontal parts also there were some remnants of an endothelial lining.

In the region of the thigh similar appearances were found, but the bloodvessels were neither so numerous nor so densely packed with blood corpuscles as in the tumour on the head. Fat cells also were nowhere visible. The muscles did not show any variations from the normal. The spaces Steinwirker regarded as lymphatic in character, and the condition he called *elephantiasis congenita lymphangiectodes.*

Neelsen (11) gave a very complete picture of the histological appearances in his specimen. The skin and the soft parts underlying it showed a change all over the body, with the exception of the palms of the hands and the soles of the feet. The change varied in intensity: where it was less marked, as on the trunk, the three layers—cutis, subcutaneous tissue, and musculature—were clearly defined; but in other parts, as on the top of the tumour, the boundary between the slightly developed musculature and the subcutaneous tissue vanished, whilst that between the latter and the cutis remained.

The cutis was nearly everywhere deprived of its epidermis through intra-uterine maceration. With this exception the skin showed no specially extensive changes. Its fibres were firm, and had a thickness either normal or but slightly diminished. The cellular elements were nowhere increased in number or changed in shape or size. In most places no trace of an infiltration with wandering cells was to be recognised, but here and there, especially in the immediate neighbourhood of the vessels, leucocytes appeared to be somewhat more numerous.

The vessels were, on the whole, wide, especially the smaller capillary loops near the surface; and contained, in addition to the red corpuscles, very many white ones. The lymphatics also of the cutis were increased; even the fine perpendicular radicles which accompany the papillary capillary loops appeared nearly everywhere as hollow clefts. Especially marked was the increase in the horizontal lymphatic network which marked the boundary

between the cutis and the subcutaneous tissue. It formed a varicose system of communicating spaces, some of which were empty, some partly filled with fibrin and separated endothelium. In lumen they exceeded by six or eight times the neighbouring vessels. In many places these lymphatic vessels formed round or irregular cystic spaces recognisable even by the naked eye, and giving to the section its peculiar spongy appearance.

This ectasy of the whole lymph vascular system, which was such a striking character of the cutis, was also found in the subcutaneous and intermuscular cellular tissues. In many places clusters of fat cells and a well-preserved musculature could be seen; but in the case of the tumour on the neck and of the greatly swollen extremities no trace of adipose tissue was to be found, and only a few small muscle bundles, the fibres of which showed granular degeneration, were visible. The muscle-bundles were thrust apart by a tissue which occupied all the space between the vessels and the lymphatics, and which consisted entirely of separate connective tissue fibrillæ loosely interwoven, and of a few cells and some elastic fibres. The network thus formed was unusually large-meshed, and showed wide spaces partly filled with coagulated blood. The cells were like ordinary connective tissue corpuscles. No stellate cells with processes forming a network, as in the so-called myxomatous tissue, were here present.

With regard to the viscera, the kidneys showed an interstitial tissue rich in round and spindle-shaped cells; and in the liver were remarkable collections of round cells lying in the interacinous tissue, especially near the branches of the portal vein, and constituting a pathological change like that seen in the lymphomata of extra-uterine life.

Everke (12) found that the septa of the cysts in his specimen were made up of fibrous tissue in which a few nuclei were seen. There were numerous spaces between the bundles of fibres, such as there are in a richly lymphatic vascular tissue. No endo- or epithelium could be made out in their interior. Under the skin of the cheeks and head there was a very marked and uniform thickening and hardening of all the soft parts. Microscopically this showed a fibrillary tissue, between the separate bundles of which may have been an accumulation of mucus. Near the

umbilical cord the subcutaneous tissue was from 6 to 7 mms. in depth; and since, said Everke, the umbilical vessels had to pass through this tissue, they may have been compressed, and so have led to the dropsy and ascites. Changes due to maceration prevented a more thorough histological research.

Lindfors (13) found that the cut surface of the tumour in his specimen consisted of a shaggy network of loose connective tissue, in the meshes of which lay numerous lymphoid cells. It was here and there traversed by tortuous enlarged vessels filled with blood corpuscles.

In Wilson's case (14) the swellings on the trunk were composed of large cysts with thin walls; whilst those on the limbs contained dilated lymph spaces, surrounded by thickened walls and hyperplastic connective tissue. These spaces were lined by proliferating endothelium and cylindrical epithelial cells. In some instances they were filled with broken down lymph corpuscles. Here and there in the section the fibres of the connective tissue were replaced by a homogeneous granular substance containing many nuclei in a state of granular degeneration. There was no myxomatous tissue. In the section from the leg there was a hyperplasia of the connective tissue; the number of vessels was increased, and in their neighbourhood was a small cell infiltration. The lymph spaces were dilated, but did not seem to communicate. The fat tissue existed in normal amount. The cysts in the large tumours contained serous fluid, sometimes mixed with blood. Here and there were large, transparent, faintly granular cells with multiple vesicular nuclei; these were probably endothelial cells in a state of mucin-degeneration.

B. Morbid Anatomy of the Annexa.

In the records of cases of congenital cystic elephantiasis it is uncommon to find any account of the condition of the fœtal annexa. Neelsen (11) states that in his specimen neither the placenta nor the umbilical cord showed any anomalies. In Everke's case (12) a portion of cord was still attached to the child's abdomen, and it was not abnormal. Lindfors (13) described the placenta as very voluminous and pale; the maternal surface

was much broken up; and there was œdema. The cord was only 40 cms. in length, and was thin and atrophic. The placenta of Wilson's specimen (14) was friable; but it was normal in size, thickness, and colour. Under the microscope the ground tissue of the villi was in some places increased, and, combined with the degenerated decidual cells, presented the structureless appearances which in a more developed form are found in the myxomatous placenta. There was no inflammatory infiltration. The cord showed on section a dense infiltration round the vessels, and there was thickening of the media and adventitia of the arteries.

CHAPTER XVI.

GENERAL CYSTIC ELEPHANTIASIS OF THE FŒTUS—Continued.

ETIOLOGY AND PATHOGENESIS; DIAGNOSIS; PROGNOSIS; TREATMENT; LITERATURE.

Etiology and Pathogenesis.

We have now to consider whether we can draw from the recorded clinical histories any facts that may serve to elucidate the *etiology* of general cystic elephantiasis. Unfortunately for this purpose the clinical details that have been given are scanty.

In two out of the five cases in which information is forthcoming the mother was quite strong, but in the other three she was in bad health. The history of long-continued scrofulous manifestations in No. 11 and of chronic bronchitis in No. 15 are specially interesting in this relation. The number of her previous pregnancies does not seem to be of etiological importance, and past obstetric experiences appear to have been as good as usual in all the cases in which they were noted. Abnormal symptoms seem to have been present in most of the pregnancies which terminated in the birth of fœtuses affected with cystic elephantiasis. Interruption of the gestation at some period before the full term was a constant character; this may, however, have been due to the death of the fœtus, to the concomitant hydramnios, or to the renal affection of the mother. The hydramnios and the maternal nephritis, it must be granted, are as likely to have been effects as causes of the fœtal malady. The condition of the placenta may be of some etiological value, for it was certainly abnormal in Nos. 13 and 14; but here again it is quite as justifiable to consider this the result as to look upon it as the cause of the morbid state of the fœtus. There is, however, one important obstetrical fact which has a direct bearing upon the etiology of the disease, and that is the frequency with which the affected fœtus was one of

twins or triplets. This was noted in four cases, and we are, therefore, led to suppose that in these instances at any rate the cause of the malady was to be sought for in the fœtus itself or in the annexa, for in all of them the other fœtus or fœtuses were normal. It is also worthy of note that in ten out of fifteen cases the fœtus was a female; but whether this is to be regarded as of etiological value or not must be left doubtful. We are forced then to conclude that the clinical history of the cases does not throw much light upon the causation of the disease; but the scrofulous manifestations in the mother and in her other children in No. 11, and the plural character of the pregnancy in Nos. 1, 4 (*f*), 5, and 15, are worthy of consideration.

With regard to the *nature* of the morbid process, nearly all the writers who have described specimens have come to the same conclusion. They have regarded it as a condition of dilatation or of dilatation and occlusion of lymphatic spaces and vessels—as a lymphangiectasis (Steinwirker, Neelsen, Everke, Lindfors, and Wilson). Meckel, however, regarded the jelly-like subcutaneous tissue in his case as of very low organisation, compared it to that found in Medusæ, and considered that it was due to an exhausted formative power that could not produce anything more differentiated in structure. Everke also, whilst he preferred the lymphangiectatic theory, thought that the disease might possibly be due to a myxomatous metaplasia of the subcutaneous connective tissue. With these exceptions, the view that we are here dealing with an ectasy of lymphatic vessels has been adopted by all. The fact that large cysts have been found in certain regions of the body has been explained by supposing that in these regions the morbid process had been longer established and had reached a more advanced stage of development than elsewhere.

There is one point, however, with regard to which there has been a difference of opinion. Some authors (*e.g.*, Virchow (7)) have considered hyperplastic changes in the subcutaneous tissue as the primary phenomena, whilst others (*e.g.*, Neelsen (11)) have looked upon the distension of the lymphatics as the first change, and have regarded the increased growth as secondary. Neelsen found in his specimen a tissue showing no signs of proliferation. It was made up of greatly distended lymphatics and tissue spaces,

and this gave it its voluminous character; but it was not materially richer in its constituent parts than is ordinary connective tissue,—it was simply œdematous and swollen. He could, indeed, trace in it atrophic changes in the muscles and fat. He did not at the same time hold that hyperplastic alterations were entirely absent; but he regarded them solely as secondary, and, as regards the nature of the process, unimportant phenomena. The essential pathological element was the chronic œdema. Virchow, on the other hand, maintained that the œdema was only an accidental accompaniment; he regarded the disease as a cystic form of congenital elephantiasis, whilst Neelsen looked upon it as general dropsy. Steinwirker adopted Virchow's belief, for he stated that the appearances justified him in considering the malady as cystic congenital elephantiasis, and he had no objection to calling his case one of elephantiasis congenita lymphangiectodes. Everke seems to have been of the same opinion. Lindfors and Wilson, on the other hand, were inclined to accept the view advanced by Neelsen; and judging from the microscopic appearances found in my case, and considering the close resemblance to general dropsy in the twin shown by the specimen, I also am led to favour his supposition.

Neelsen, of course, recognised that there was a difficulty in the way of the acceptance of his hypothesis, for there was in his specimen no evident cause for the œdema. The whole circulatory system was normal. He was, therefore, led to look for the cause in the state of the blood. Here again he was met by a difficulty, for the blood did not exhibit the abnormal microscopic appearances found by Klebs in his specimen of general dropsy, and there was no syphilitic dyscrasia as in the case narrated by Schütz. He found an explanation, however, in the following series of circumstances: the mother of the child had suffered in the last months of pregnancy from nephritis with uræmic phenomena and marked œdema; she was also, both at the time of labour and for weeks previously, hydræmic; and this altered condition must have influenced the state of the blood in the unborn infant, and have led to the development of hydræmia in the fœtus also. But why, he had to ask himself, was the œdema confined to the subcutaneous tissue, why was there no ascites and no hydrothorax? In

answering this question he stated that he agreed with Cohnheim in his belief that hydræmia only produces œdema in those organs and tissues the vessels of which have walls of unusual permeability. This condition was met with typically in the early stages of inflammatory irritation. Neelsen then proceeded to point out that there were certain evident signs of inflammatory processes in his specimen; and he believed that he had discovered the cause of these in the fact that the mother suffered from scrofula, and that her other children had skin affections of a scrofulous nature. In a word, he considered that the œdema was due to hydræmia in a fœtus whose tissues showed inflammatory processes of a scrofulous character. Wilson expressed a very similar opinion, and looked to the theory of a blood dyscrasia with œdema and secondary inflammatory changes in the subcutaneous tissues as affording the most probable explanation.

The microscopic appearances that my specimen presented pointed to an œdematous process; and there was in this case no necessity to invoke maternal hydræmia or any other dyscrasic state as a causal factor, for the dropsy was evidently due to the peculiar vascular conditions which here existed. The fœtus was acardiac, and had a very limited blood supply, which came either from the placenta, membranes, or cord of the normal twin infant. Further, since the circulation was thus carried on at a considerable distance from the propelling force—the heart of the normal fœtus—it must have been markedly slow and imperfect. In a word, the conditions favourable to the development of dropsy were present. The specimen, however, differed in one particular from those described under the name of general dropsy in the twin fœtus: there were large cysts in the cervical region. This difference may be explained by the fact that in other specimens gradations in the size of these cysts are met with: thus in Steinwirker's case they were only as large as a pin's head; in Meckel's (if we may judge from his drawing, plate ix. fig. 2) they had the size of a pea; and in Everke's specimen they varied in their dimensions, some being as large as a cherry, others as large as a pigeon's egg. This pathological detail, therefore, forms no sufficient reason for separating my case from those usually described as general dropsy. The size of the cysts probably depends on the

intensity of the morbid process and the length of time that it has been in action. In other words, it seems to me that the condition known as general cystic elephantiasis is simply a more advanced stage and a graver form of general fœtal dropsy.

Should, then, the term *elephantiasis* be employed to designate this condition? This is a question which it is difficult to answer, and before attempting to do so, it is necessary to consider shortly the states that are usually regarded as of the nature of congenital elephantiasis.

Virchow (7) groups *elephantiasis arabum* among the fibromata, looking upon it as the more diffuse form of that pathological state. Elephantiasis arabum, when it occurs in later life, is of two kinds, elephantiasis *cruris* and elephantiasis *genitalium*, according as it affects chiefly the thighs or the scrotum in the male, and labia in the female (Kaposi); but there is also a *congenital* condition which Virchow regards as elephantiatic which may affect the whole body. This elephantiasis congenita, he found, usually belonged to the *soft* variety, for this author further subdivided all cases of elephantiasis into *E. dura* and *E. mollis*. Fœtal elephantiasis, then, according to Virchow, almost always was to be grouped among the cases known as E. mollis.

Elephantiasis congenita mollis may affect in some cases an entire extremity, or it may show itself at numerous places on the surface of the body, either in the form of more regular tumefactions which involve a part of the limbs or trunk, or in that of veritable tumours, solid or cystic, rising in more or less voluminous masses upon the surface of the skin. This disease is probably the same as that described by other authors under the name of fibroma molluscum, by V. Mott as pachydermatocele, by Nelaton as elephantoid molluscum, and by Von Recklinghausen as multiple cutaneous neurofibroma. Ziegler (16) agrees with Virchow that it is well to designate it congenital elephantiasis, in order to distinguish it from acquired elephantiasis; and he goes on to state that whilst "the various affections which have been described as elephantiasis arabum are certainly not all of the same nature," yet "if we except what is sometimes called elephantiasis mollis or fibroma molluscum, an affection depending upon some congenital condition, they are all associated with some cause which gives

rise to long continued or often repeated inflammation of the integument."

To return to Virchow's description of congenital elephantiasis mollis, it is stated by him that it has sometimes a nearly general extension over the whole body. This is notably the case with acephalic and anidean monsters, where the predisposing cause may quite well be the imperfect circulation. In such a fœtus the blood-pressure is weaker than in the normal twin born along with it, there is obstruction in the arterial system, and the escape of the venous blood is also interfered with. This causes the development of a universal, or more often of a partial, œdema, with very frequently an enormous hypertrophy of the connective tissue. The cases of congenital elephantiasis which persist during the rest of extra-uterine life are always partial. They do not, in the great majority of instances, present the lardaceous tendinous hardness nor sclerosis of tissue met with in the acquired forms. The subcutaneous tissue is the part chiefly affected, and according as the disease begins early or late in intra-uterine life, the result is slightly different. If it begin late, at a time when the fat is already formed in the subcutaneous tissue, the whole has rather the appearance of a polysarcy. If, on the other hand, it commences early, when there is yet only mucous tissue lying beneath the skin, this persists as a soft, gelatiniform, œdematous layer. There are usually other peculiarities in these cases, such as are not met with to the same degree in acquired elephantiasis; of these, the hyperplastic development of the vessels is often very marked, and there may be a like state of the nerves and even of the muscles and bones. When the vessels are specially implicated, the hyperplasia may affect the veins and capillaries, or the lymphatics, giving rise in the former case to elephantiasis congenita telangiectodes, and in the latter to elephantiasis congenita lymphangiectodes. Virchow not uncommonly found cystic growths in the congenital tubercles, and although he could not trace a connexion between them and the lymphatics, yet he concluded, from their appearances and contents, that they had a lymphatic origin. When these cysts were present he called the disease elephantiasis congenita cystica, and stated that the best example of it in a localised form was to be found in macroglossa: it is evidently only an advanced

stage of the condition known as elephantiasis congenita lymphangiectodes.

From this review it would seem that the term congenital elephantiasis has been applied to conditions which differ very considerably amongst themselves; and if this name be used in speaking of them all, it must be conceded that in some of them its most characteristic feature—hyperplasia—is absent. Still if œdema be regarded as the initial lesion, it is possible to look upon the different conditions found as the intermediate links in the chain that has simple œdema at one end and general hypertrophy of the tissues—cutaneous, subcutaneous, muscular, and osseous—at the other. For it is possible that œdema, when chronic, may lead to hyperplastic changes in the various structures affected,—it may, in fact, take the place of the cause of irritation which can usually be found in acquired elephantiasis. Perhaps, also, the various appearances found in different cases may be due to the nature of the œdema, which may be in some inflammatory, in others obstructive, and in yet others hydræmic. Other minor differences may depend upon the period in intra-uterine life when the morbid process began, upon its severity, and upon some peculiar predisposition to one or other pathological change existing in the tissues affected.

By some such theory as the above it seems possible not only to group together general dropsy in the single and in the twin fœtus and general cystic elephantiasis, but also to recognise that these states have a close relationship with such localised affections as congenital elephantiasis limited to one or other part of the body, cystic hygroma, macroglossa, macropodia, and fibroma molluscum.

Diagnosis.

In the present state of our knowledge it is impossible even to suspect the existence of this fœtal disease during pregnancy, for neither in the maternal clinical history nor in the phenomena of the gestation is there any clue forthcoming. Even after labour has set in it will probably not be possible to make more than a provisional diagnosis until either the head or a limb has appeared at the vulva, for during parturition the very presence of the morbid process may confuse the observer. Thus, in the case recorded in

Chapter XIV., Dr Edmondson was misled by the œdematous and deformed state of the lower limb, and did not recognise that he had to do with a leg until that part was extruded from the vagina.

After labour is over, the appearances of the disease are so characteristic that they cannot well be mistaken. The universal anasarca; the presence of cysts as revealed by the sensation of fluctuation, especially in the cervical region; and very often the existence of large subcutaneous tumours on the head and elsewhere, make up a group of very distinctive changes.

It is impossible to differentiate this disease from some cases of general dropsy in the twin fœtus. Thus the specimen described by Smith and Birmingham (*v.* page 170), and that noted by Bianchi (*v.* page 172), might have been classed as cystic elephantiasis; whilst Wernher's case and that of Göller might be placed among the examples of general dropsy in the malformed twin. The differences that exist are probably only those of degree. With regard to the differential diagnosis between general cystic elephantiasis and the other forms of congenital elephantiasis, probably the only real distinguishing feature is the universal character of the subcutaneous lesion in the former and its localized nature in the latter; but this matter has already been referred to under the head of Pathogenesis.

Prognosis.

a. Maternal.—The birth of a fœtus suffering from cystic elephantiasis does not in itself seem to cause much danger to the mother. The fact that such an infant is almost invariably born before the full term forms, however, an extra risk; and in one or two of the recorded cases the labour has been delayed or accompanied by hæmorrhage (Nos. 13 and 15).

b. Fœtal.—Since in nearly every case the infant was immature, its chance of surviving its birth was but small; and since this disease is often accompanied by other malformations grave enough in themselves to prevent a separate existence, the prognosis is almost universally bad. In one case, however, the infant lived for thirty minutes (No. 14), and in another (No. 8) the child had reached the age of twenty months when it was put upon record. In the

latter instance there had been a progressive amelioration in the condition from the time of birth, and it thus forms an exception to the rule that regards as non-viable fœtuses affected with this disease.

Treatment.

If labour be delayed on account of the bulk of the fœtus, it may be necessary to make incisions in the skin of the presenting part, or to open the cysts at the back of the neck; but this does not seem to have been required in any of the recorded cases, for a moderate amount of traction usually served to complete the delivery.

From what has been said concerning the immature state of the fœtus, and the frequent presence in it of grave malformations, it is evident that treatment after birth is rarely needed. If, however, the infant be born alive, and be not the subject of serious deformity, the use of the incubator might prove beneficial. Until we know more of the cause of the morbid process, any further treatment must be pure guess-work.

Literature.

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„ 577. (*b.*) Fetus humanus duobus hygromatis cervicalibus vitiosus.
„ 578. (*c.*) Fetus humanus duobus hygromatis in cervice deformatus.

Specimen 579. (*d.*) Fetus humanus anasarca et hygromatis duobus cervicalibus deformatus.

„ 580. (*e.*) Monstrum humanum hygromatis duobus cervicalibus deturpatum.

„ 581. (*f.*) Monstrum humanum rhachitide, anasarca et duobus tumoribus cervicalibus insigne.

„ 582. (*g.*) Fetus humanus duobus hygromatis cervicalibus monstruosus.

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CHAPTER XVII.

GENERAL FŒTAL DROPSY AND CYSTIC ELEPHANTIASIS.

SIMILAR CONDITIONS MET WITH IN THE LOWER ANIMALS—GENERAL CONCLUSIONS WITH REGARD TO GENERAL DROPSY AND CYSTIC ELEPHANTIASIS.

In the preceding chapters the closely allied morbid states known as general dropsy and cystic elephantiasis have been described as they occur in the human fœtus; but it is now necessary to say something of these diseases as they are found in the young of some of the lower animals.

In the records of veterinary obstetrics there are found scattered references to general dropsy both in the single fœtus and in the malformed twin, and I have discovered a few cases (including that of L. Franck) which must, I think, be regarded as instances of general cystic elephantiasis. It will be well to consider in order these three diseases as they are met with in the fœtuses of the lower animals.

General Dropsy of the Single Fœtus.

Synonyms.—The names "water-calves" and moon-calves" (Wasserkälber und Mondskälber) have been given to cases of fœtal dropsy in the lower animals; but it would seem that two different pathological conditions have been included under these designations. Both of these, it is true, are dropsical in their nature; but whilst in one there is œdematous infiltration of the skin along with the presence of fluid effusions in the thoracic and abdominal cavities, in the other there is ascites alone. The former condition is that which is strictly comparable with general fœtal dropsy in the human subject. A survey of the recorded cases shows that the two states (general dropsy and

ascites) have been usually confounded, and it seems almost impossible now to assign many cases to their proper place on account of the absence of exact or sufficient details. It may be, therefore, that some of the cases hereafter noted were examples of simple ascites and not of general anasarca.

Historical Note.—In 1830 Binz (1) recorded the case of a dropsical calf, the head and one fore limb of which had been expelled from the uterus; the chest had to be opened and the thoracic and abdominal fluid allowed to escape before delivery could be completed. Pauli (2), in 1842, and Lehnhardt (3), in 1843, noted cases of general infiltration, the former in the fœtus of the mare, the latter in that of the goat. Rainard (4), in 1845, noted a number of cases of general anasarca in the calf which had been seen by Noyes in one year, and two instances reported to him by Rouchon and Courjon, in both of which the abdomen of the calf had to be punctured before delivery could be effected. Courjon, also, had seen a case in which during the attempts at delivery the abdominal walls of a calf had ruptured and twenty litres of fluid escaped. Voigtlander (5) related how a calf affected with general dropsy had to have its forelimbs extracted and its thorax and abdomen opened before it could be born. Dinter (6) noted a case in which the exertions of five men could deliver a dropsical calf no further than the shoulders; further progress was possible only after a large quantity of serum had been withdrawn from the body. In Anacker's case (7), however, the extraction could not be effected by the natural passages, and the fœtus had to be removed by gastro-hysterotomy. Müller (8) and Gierer (9) reported instances in the calf, which may, however, have been examples of simple ascites. Saint-Cyr (10), in 1875, described three somewhat similar cases, also in the calf, which had been communicated to him by Arloing; in one of these there was enlargement of the liver and kidneys with cystic degeneration of the latter and an inflammatory condition of the peritoneum. Franck (11) in 1876 wrote, in his text-book, upon "water-calves," and narrated a case observed by Schwarz which seems to me to have been one of congenital cystic elephantiasis; Franck also, in 1879, described another specimen (13) which probably belonged to the same category. Fleming, in his work on *Veterinary Obstetrics*,

published in 1878, gave a good account of general dropsy in the fœtus of the lower animals, and I have drawn largely from his work and from that of Franck in the writing of this chapter.

Frequency.—As in the human fœtus so in that of the lower animals general dropsy is a rare disease. It is less frequent, according to Fleming, than hydrocephalus. The cases recorded have chiefly occurred in the calf, but examples in the foal and kid have also been noted.

Clinical Features.

a. During Gestation.—It was in some cases noted that the mother animal was in a good state of health during the gestation that ended in the birth of a dropsical fœtus, but in other instances it was observed that she was hydræmic. Hydramnios occasionally was present. The abdomen of the mother was usually so large that a plural pregnancy was diagnosed.

b. At the time of Parturition.—Labour usually occurred prematurely, *e.g.* at the seventh month in cows; but sometimes the full term of gestation was reached. Franck ascribed the interruption of gestation to the state of over-distension of the uterus. Abnormal presentations and positions do not appear to have occurred often.

Parturition was in all cases greatly delayed, and instrumental measures were usually necessary to effect delivery. Commonly part of the fœtus was born, and then further progress did not occur. Traction upon the body by the hands or cords; the puncturing of the abdominal walls directly, or of the diaphragm through the opened thorax; and embryotomy, seem to have been the means chiefly used to complete delivery. Sometimes deep incisions in the œdematous skin were made to allow of the draining away of the serum contained in its meshes. In one case (7) gastro-hysterotomy was required. Abnormalities in the expulsion of the placenta do not seem to have been noted.

The mother does not appear to have suffered much after parturition was accomplished; but in one case (Courjon's) it was stated that the cow was in great danger for a month afterwards.

No fœtuses seem to have been born alive; in some cases they died before the onset of parturition, in others they were killed by the means adopted to effect delivery.

Pathology.

The dropsical fœtus is usually much larger than normal. Noyes, quoted by Rainard (4), says that such calves were twice or thrice the ordinary size, and that the head was enormously large. The large size is due to the universal anasarca, and to the frequent concomitant conditions, ascites and hydrothorax. In male animals the scrotum also is often greatly enlarged.

The fluid in the abdominal and thoracic cavities is usually clear, and of an amber-yellow colour. The muscles are very pale, and the subcutaneous tissue of the whole body is infiltrated with serum. The osseous system is usually normal for the period of intra-uterine life arrived at; but sometimes it shows signs of fœtal rickets. Sometimes, also, changes in the viscera were observed, such as hypertrophy of the liver, renal hypertrophy, peritonitis, and cystic degeneration of the kidneys due to atresia of the papillæ produced by increase in the surrounding connective tissue.

Pathogenesis.

Veterinary pathologists have looked in two directions for an explanation of general fœtal dropsy. Some have sought for a maternal, others for a purely fœtal cause. Those who have regarded the fœtal state as the result of abnormal conditions in the mother-animal have given, as examples of such, uterine dropsy and constitutional hydræmia. In this connexion Franck (11) has remarked that the fact that one and the same cow may give birth to a number of dropsical calves in succession, whilst other cows in the same shed produce healthy fœtuses, suggests an anomaly in the uterine vessels. He goes on to state that the occasional co-existence of fœtal rickets and general anasarca points to malassimilation or to deficient supply of protein substances and phosphates, and that one must then think of diseases in the mother, or of some anomaly in the formation of the uterine milk.

Amongst the purely fœtal causes that have been invoked to explain the origin of general dropsy are, congestion of the umbilical cord, a morbid state of the kidneys such as cystic degeneration, and perhaps peritonitis.

Diagnosis and Prognosis.

With regard to the recognition of this disease, Fleming states that its nature "can only be ascertained by vaginal or uterine exploration, though an examination *per rectum* may assist in leading to a correct diagnosis," and he goes on to say that the anasarca "will be distinguished by the general roundness of the surface of the body, owing to the subcutaneous fluid, which effaces all the prominences, and to the œdematous sensation communicated to the fingers by pressure." The prognosis for the mother-animal does not appear to have been grave; but there is no record of any case in which a living fœtus was born.

General Dropsy in the Twin Fœtus.

In the lower animals cases of general dropsy affecting one fœtus in plural pregnancies generally occur along with grave malformations or monstrosities. As in the human fœtus the form of anomaly with which general anasarca is most often associated is the acardiac or anidean. In these instances the other fœtus is well formed and not dropsical. Herran (14), however, records a case in which in a goat with hydramnios there were found twin fœtuses both markedly anasarcous; but it seems doubtful whether this case should be included here, because double and triple births may be said to be the rule in this animal (Fleming), and for the reason that neither fœtus in this instance seems to have been monstrous.

Some of the recorded cases of universal anasarca in twin anidean fœtuses may here be noted. Léaux (15) narrated a case in which a seven months' pregnant cow expelled a dead fœtus and a shapeless mass weighing five kilogrammes, and made up of a great number of small vesicles containing an amber-coloured serosity. The parturition lasted two days and the cow died. W. Snowdon (16) recorded a case in which a cow gave birth to a living female and a dead male calf, and at the same time to an anidean monster, which was described as a spongy and elastic mass containing some bones, and showing the traces of an ear and an eyelid. Another writer (17) narrated how, in a sheep that had given birth to a dead lamb and been killed, an anidean monster without head or tail was found; the limbs were rudimentary, in the centre of the mass was

a cavity containing the stomach and intestines floating in serum, and the rest of the fœtus was made up of infiltrated connective tissue. May (18) described a monstrous calf with general dropsy; and Lavocat (19) related a case in which a cow expelled an oval mass the size of a lamb's head, a great part of which was composed of a very vascular cellulo-adipose tissue, the meshes of which were filled with serosity. In both these cases there was a well-formed twin calf. E. Creswell (20) recorded the birth of a somewhat similar specimen.

With regard to the causation of the dropsy in these cases little is said in veterinary works; but in all probability the anasarca was due to the insufficient vascular arrangements, for it is usually stated that the umbilical cord in such cases was either defective or attached to the membranes only, and not to the placenta.

General Cystic Elephantiasis in the Lower Animals.

L. Franck (13) has put on record the account of the dissection of a so-called "water-calf," which must, I think, be regarded as a specimen of general cystic elephantiasis. The following is a summary of Franck's description. The calf was well preserved, of the male sex, and was entirely covered with hair. It was born at the full time, although the milk molar and incisor teeth had not yet cut through the gums. It weighed 88 lbs., but its original weight must have been greater. Much fluid had escaped through an incision that had been made in the large sac on the head for the purpose of facilitating labour. The head of the calf was small and deeply embedded in large swellings; on the small ears were circumscribed cysts as large as the fist; and on the neck, shoulders, abdomen, and pelvic girdle were large swollen protuberances like the pouches on the intestine of the horse. The body was flattened above and below. The umbilical ring was not closed. The scrotum was filled with fluid, and stood out as a projection measuring 15 cms. by 12. The feet were small and deeply hidden between the swellings. Incisions into the tumours showed great infiltration of the subcutaneous tissue and of the connective-tissue spaces, from which flowed a large quantity of clear reddish-yellow exudation. The œdematous connective tissue at some places measured in

thickness from 2 to 2·5 cms. Cyst-formations proper were not found in these tumours; but in a tumour larger than a man's head in the region of the neck, there was a large cyst-space, still partly filled with clear reddish exudation. The circumscribed swellings on the ear were also real cysts.

Both the thoracic and abdominal cavities were filled with a fluid possessing the same characters as that in the cysts. All the abdominal viscera, as also all the other parts of the calf, were in the highest degree anæmic, and were therefore pale in colour. The liver was œdematous. The ductus Arantii was already closed, and at the place of its anastomosis with the otherwise normal hepatic vein and pyloric artery there was a regular cicatrix stellate in form. There was no other abnormality in the vessels of the abdomen and thorax. . The kidneys were in a macerated condition, were normal in size, and did not appear to be diseased. The heart was small, flabby, and bloodless; the auricular walls were very thin; but the foramen ovale and its valve, the ductus arteriosus, and the large trunks arising from the heart, were all perfectly normal. The lungs were very small and rudimentary.

The causal morbid state was found in the lymphatic system. There was no trace of a thoracic duct. Further, no lymphatic vessels could be seen in connexion with the mesentery. In the case of the cow there runs at the side of the mesenteric vein a large lymphatic trunk, which can be quite easily seen in the newborn calf. In this case no trace of it was to be seen, neither were any mesenteric glands visible. There was absolutely no trace of the so-called pancreas aselli. Special search was made for the jugular, inguinal, lumbar, and axillary glands, which can all be easily seen in a healthy calf, but without success. The skeleton showed a delayed stage of development, and was affected with fœtal rickets. Parturition could not be accomplished, and the mother was killed.

Franck considered that the entire absence of the lymphatic glands and vessels had led to complete obstruction and consequent saturation of the whole body with lymph. This case is of great importance when studied along with the case of œdema in a human twin fœtus narrated by Smith and Birmingham (*v.* page 170), in

which the thoracic duct and lymphatic vessels and glands also were wanting.

Cases closely resembling that recorded by Franck were those described in 1841 by Otto (21). In both his specimens the animal affected was the calf, in both there was universal dropsy, and in both there were found in the cervical region two large cystic hygromata. It was noted that the ears were bifid, the feet curved, and the face short and flat.

It will have been gathered from what has been stated that in the fœtuses of the lower animal morbid states occur which are identical with the general dropsy and cystic elephantiasis of the human subject. In their morbid anatomy, in their symptomatology (so far as is possible), and in their supposed pathogenesis, they exactly agree. It is, therefore, not unreasonable to expect that, from accurate observations upon these diseases in the lower animals, information may yet be gained which will serve to throw light upon the same conditions in the human fœtus. It may even be found to be possible, by artificially inducing morbid states of the mother-animal (such as hydræmia), to produce general dropsy in the fœtuses still in utero.

Summary of Conclusions with regard to General Dropsy in the Single and in the Twin Fœtus, and General Cystic Elephantiasis.

It may be useful here to gather together some general conclusions which seem warranted by the study of the cases of general dropsy and cystic elephantiasis that have been described in the foregoing chapters.

They are all rare conditions of the fœtus, but general cystic elephantiasis appears to be rarer than general dropsy.

They may all be accompanied by morbid states in the maternal organism, such as renal disease, blood disorders, and cardiac and hepatic affections; but such are much less common in general dropsy of the twin fœtus and in general cystic elephantiasis than in general dropsy of the single fœtus.

Hydramnios is a very frequent, but not a constant feature in general dropsy affecting the single fœtus, and it occasionally occurs as a concomitant condition in dropsy of the twin and in cystic

elephantiasis. Œdema of the placenta has a very similar connexion with these fœtal diseases.

In their pathological nature the three maladies closely resemble each other,—in all, the changes found are of the nature of œdema; but a closer resemblance exists between dropsy in the twin fœtus and cystic elephantiasis than between either of these diseases and general dropsy in the single fœtus. It is even doubtful whether cystic elephantiasis and dropsy in the twin ought to be separated at all.

The dropsy in the twin cases and in cystic elephantiasis is more often gelatinous in character, and it is usually more pronounced in type than that in the single fœtus; in cases belonging to the former groups it is also more frequently accompanied by grave structural lesions and by gross malformations than in those that have been classified as general dropsy in the single fœtus.

It may perhaps be stated that, as a general rule, dropsy in the single fœtus is hydræmic or cachectic in origin, whilst it is obstructive in the twin fœtus, and possibly inflammatory in cystic elephantiasis.

In general dropsy of the single fœtus the pathogenetic factors are usually cachectic maternal conditions, a placental morbid state, and an induced blood disease (leukæmic, hydræmic, or anæmic) in the fœtus; but sometimes a sufficient cause exists in the fœtus alone (malformed heart or cystic kidneys). In dropsy of the twin the disease is probably always due to cardiac or vascular anomalies (deformity or absence of the heart, malformation of the umbilical cord, etc.). In cystic elephantiasis the cause is in some cases to be found in vascular anomalies in the fœtus or its annexa (absence of thoracic duct, etc.), but in others it seems necessary to look for an explanation of its origin in maternal dyscrasia accompanied by a predisposing morbid state of the fœtal subcutaneous tissue or blood. General dropsy in the single fœtus is a condition which sometimes repeats itself in successive pregnancies occurring in the same mother; dropsy in the twin and cystic elephantiasis do not appear to have this tendency.

In general dropsy in the single fœtus syphilis has sometimes been regarded as the cause. It is true that the syphilitic fœtus is often affected with general dropsy, but such cases ought not

to be considered along with those above mentioned, for the dropsy is different in its nature—it is sanguinolent, not anæmic. They are examples of a transmitted, not of an idiopathic disease. For this reason the cases of Cruveilhier, Schütz, and Habit will be considered again when fœtal syphilis comes to be dealt with.

General dropsy and cystic elephantiasis have a more or less close relationship to congenital elephantiatic manifestations of a localised character, to cystic hygromata of the neck, to some cases of congenital sacral and coccygeal growths, and to certain of the conditions that are described as sclerema and œdema neonatorum.

General dropsy and so-called fœtal rachitis sometimes coexist in the same specimen (Nos. 22 and 23); the relationship of the two morbid processes to each other will be taken up when the latter is considered.

It does not appear to be possible, in the present state of our knowledge, to diagnose either fœtal dropsy or cystic elephantiasis before the onset of labour; during parturition, however, a skilful observer may recognise these diseases; and they can scarcely be mistaken after birth.

The prognosis for the infant seems to be almost invariably bad; but the mother rarely suffers seriously from the effects of giving birth to such diseased fœtuses.

Till the causes which give rise to these morbid states are better known there seems to be no possibility of discovering therapeutic measures to check or prevent them, and even when the infant is born alive no treatment seems to be of much value for prolonging life.

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CHAPTER XVIII.

GENERAL FŒTAL OBESITY WITH DROPSY.

OBSTETRICAL AND CLINICAL HISTORY, AND PATHOLOGY OF SPECIMEN D; NATURE OF THE MORBID PROCESS.

I PURPOSE to describe in this chapter a case of fœtal disease about the exact pathological nature of which I am in some doubt. The specimen was kindly given me by Dr A. H. Freeland Barbour, in whose practice it occurred. It may be regarded provisionally as an example of general obesity of the fœtus (lipomatosis congenita universalis) with dropsy. The clinical details of the case, which were furnished by Dr Barbour, were as follow:—

Obstetrical and Clinical History of Dr Barbour's Case. Specimen D.

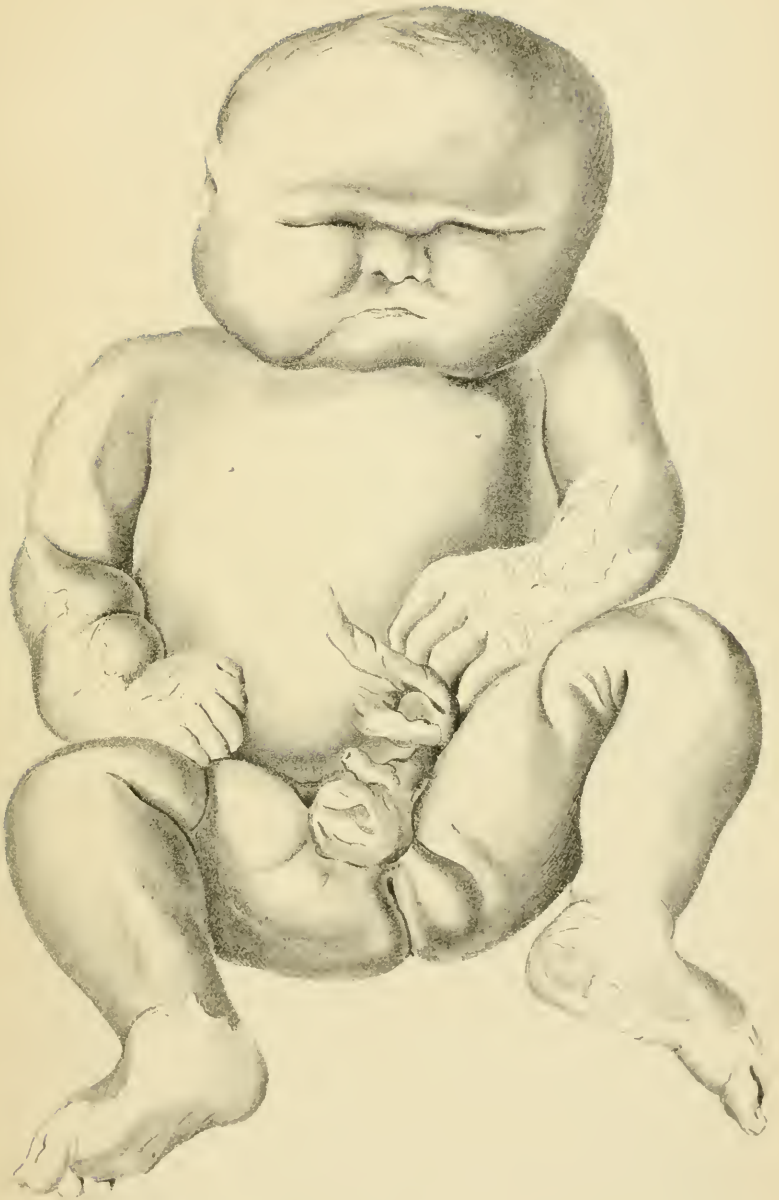
The mother of the fœtus was thirty-five years of age, and had been seven times pregnant. All her pregnancies had gone to the full term, and had resulted in the birth of healthy infants. In this, the eighth gestation, she had shown no abnormal symptoms till the later months, when on several occasions slight hæmorrhage occurred, suggesting the existence of placenta prævia. Twenty-one days before the birth of the child she had a slight fall, and from that date the fœtal movements were no longer felt. During the confinement, which occurred in August 1891, there was early rupture of the membranes, with the escape of a very small quantity of liquor amnii. The breech presented, and as there was some hæmorrhage an attempt was made to control it by pulling down a leg. This manœuvre Dr Barbour found very difficult of accomplishment on account of the great size of the child and the swollen character of its integument. Considerable traction was needed to deliver the child, which was dead, showed peeling of the

skin in various places, and appeared to have a generally dropsical state of the subcutaneous tissues. It was then discovered that there had been a low implantation of the placenta, which fully accounted for the hæmorrhage during pregnancy and labour. The after-birth was small and shrivelled; unfortunately it was destroyed. The mother had previously enjoyed good health, and had not during this or any other pregnancy suffered from dropsy, albuminuria, or other morbid state. *She was, however, very stout* and of medium height. The father, who was under the usual height, had also always enjoyed good health. There was no trace of syphilis in either the mother or the father.

Morbid Anatomy of Specimen D.

A. *External Appearances.*

The external appearances of specimen D are well reproduced in Plate XII. In many points this fœtus resembled cases A and B; but there were also characters that were different. There was universal œdema, the skin everywhere pitting upon pressure; but there was not the peculiar glossy pink and yellow appearance seen in the other specimens. Further, the infant had been dead in utero for about three weeks; and, therefore, the process of maceration had been going on, with the result that the cuticle had peeled off in most parts of the body. The thorax, abdomen, thighs, and upper arms were entirely denuded of the epidermal layer of the skin, which in the case of the hands and feet was only loosely attached to the underlying derma. The infant, therefore, had a general reddish hue, with here and there flakes of dirty white cuticle attached to the skin. There was well-marked grooving at the flexures of the limbs. In the region of the head the anasarcous state of the skin was very evident, the eyes being entirely concealed by the surrounding swollen tissues. The head was deformed, for the macerative changes had made it possible for marked displacement of the bones of the cranium to occur. The abdomen and thorax were very prominent and large, and in the case of the former region it could be felt that fluid was present in considerable amount in the peritoneal cavity. The scrotum and penis were anasarcous. The stump of the umbilical cord was not



General Fœtal Obesity with Dropsy, Case D ($\frac{1}{2}$ Nat. Size).

swollen and œdematous as in Specimens A and B, but was rather small and flattened. The infant was a male, and weighed ten and a half pounds. Save for the anasarca it was not deformed in any way.

The *measurements* were as follow:—The total length from vertex to heel was 53·2 cms., whilst that from vertex to symphysis pubis was 33 cms. The circumference of the abdomen was 40 cms., that of the thorax was 38 cms.; and both exceeded by several centimetres the greatest circumference of the head.

The cranial diameters were:—Maximum, 15 cms.; O.M., 13 cms.; O.F., 14 cms.; s.O.B., 14 cms.; Bi-T., 11 cms.; and Bi-P., 12·5 cms. From the chin to the anterior fontanelle measured 14·5 cms. The transverse diameter of the thorax was 12 cms., and the antero-posterior 10 cms.; the bis-acromial diameter was 15 cms.; the transverse diameter of the abdomen was 14·5 cms., and the antero-posterior 11·5 cms. The circumference of the leg below the knee was 13 cms., that of the thigh 20·3 cms., that of the forearm 14 cms., and that of the upper arm 14·6 cms. The measurements on opposite sides of the body did not differ perceptibly.

The Placenta and Umbilical Cord.—The placenta was unfortunately destroyed; but Dr Barbour noted that it was small, dark red in colour, and shrivelled, and, therefore, quite unlike the afterbirth of specimens A and B. The cord was not œdematous, but rather thin, blood stained, and flattened.

B. *Pathological Appearances of the Viscera, etc.*

Naked-eye Appearances.—Simple dissection was employed to reveal the characters of the tissues and organs.

Vertebral Column.—The spinal column was well ossified, and there was no spina-bifida. There was no fixed curvature. The spinal cord was soft and shrunken, but did not appear otherwise abnormal.

The Region of the Head.—The subcutaneous tissue of the scalp was infiltrated with reddish serum, and the pericranium could with great ease be separated from the bones. The anterior fontanelle measured 4 cms. in length; and all the bones of the vault moved very easily on each other, and by pressure the head

could be made to assume various forms. On opening the skull it was noted that the brain was much shrunken; it was almost fluid in consistence, and over the left upper surface, under the parietal bone, was seen a meningeal effusion of blood. There were no signs of hydrocephalus, and the brain convolutions and fissures appeared to be normal in their arrangement. The basis cranii was normal; and the region of the face showed nothing pathological, save the great thickness of the subcutaneous adipose tissue layer, in which there was sanguinolent œdema.

The Region of the Thorax.—In both the pleural sacs and in the pericardial cavity was a considerable quantity of blood-stained serous fluid. The lungs were soft and unexpanded; the heart also was soft, friable, and collapsed. There were no anomalies in the cardiac valves or apertures. The interior of the heart contained a muddy reddish-coloured fluid—altered blood. The thymus gland was normal in size, but was dark in colour and soft in consistence.

The Region of the Abdomen.—There was a considerable quantity of reddish serum in the abdominal cavity, and the peritoneum in the neighbourhood of the liver was adherent to that organ. The liver was of a yellowish-green colour, soft, and shrunken in size. The stomach and intestines were collapsed, and contained a partly fluid reddish matter, with some green meconium in the sigmoid flexure and rectum. The right kidney was enormously congested, and round it was a large quantity of fluid blood; the organ measured 4·7 cms. vertically, 2·1 cms. antero-posteriorly, and 3·3 cms. transversely. The substance of the left kidney was almost entirely destroyed by one large and several small cysts which contained a reddish-yellow fluid; this cystic kidney measured 4 cms. vertically, 1·8 cms. antero-posteriorly, and 2·5 cms. transversely.

The subcutaneous tissue formed a very thick layer of fat all over the body. It measured from 1·8 to 2 cms. in thickness, and appeared to consist of nothing but adipose tissue in a slightly dropsical state. Under the microscope it showed a cutis in which the constituent elements could not easily be recognised, and a subcutaneous layer of reticular tissue, in the meshes of which some oil globules remained.

Nature of the Morbid Process.

It is difficult to come to any very satisfactory conclusion as to the nature of the morbid process in this case. The fœtus had been dead for two or three weeks before birth, and presented, therefore, the signs of maceration. For this reason many of the pathological conditions must be looked upon as post-mortem states. It cannot, however, be exactly determined which were the conditions thus produced; for the pathology of intra-uterine death is a subject which has not yet been fully investigated, and I am convinced that several of the changes ascribed to maceration are really the result of disease that has existed before death. It may, perhaps, be concluded that the separation of the cuticle and the changes in the viscera (with the exception of the cystic state of the left kidney) were due to macerative processes; whilst the cavity dropsies and the anasarca, which were sanguinolent in character, may have been produced by the same cause, or may have been the results of the cystic degeneration of the kidney, or may have been the joint product of both these pathogenetic factors. I am inclined to adopt the last-named hypothesis, and to regard the case as one of general fœtal dropsy due to renal cystic changes, followed by intra-uterine death. At the same time it must be confessed that the condition of the placenta does not tally very well with the acceptance of this theory, for the afterbirth was small and shrunken, and it may be that the death of the fœtus was to be explained by its condition, and that the morbid states found were simply the results of maceration.

There was, however, one pathological manifestation which could scarcely be explained by the existence of general dropsy, or regarded as due to post-mortem changes. That was the presence of a greatly thickened subcutaneous adipose tissue layer—general fœtal obesity. The condition was well marked all over the body, but was especially evident on the abdomen and limbs. The great weight of the infant was no doubt in large measure due to the state of obesity, as were also the delay and difficulty in labour which were experienced.

No doubt most of the cases of very large new-born infants that

have been put upon record[1] were examples of general obesity or adipose polysarcia; but in their description little or no emphasis has been laid upon the state of the subcutaneous tissue. A few instances, however, are to be found in which the authors who related them referred specially to the general obesity, and of these the cases of Clauder, Sandifort, Walther, and Chambers,[2] are worthy of note; but none of the cases above mentioned was exactly similar to that described in the foregoing pages as Specimen D. For in this instance the microscopic appearances of the subcutaneous layer were not those of normal adipose tissue, they were rather those of a reticular structure from which most of the oil globules had disappeared. The characters of the subcutaneous tissue were somewhat of the nature of those described in the recorded cases of adipose sclerema, or adipose œdema neonatorum; but they did not entirely correspond with the conditions found by me in specimens of these diseases.[3] Possibly the differences may have been due to the post-mortem changes which had occurred in Specimen D.

The exact pathology of the appearances in this case must then be left doubtful; but it seems most likely that it was of the nature of general obesity with dropsical changes and with the results of intra-uterine maceration added thereto. The fact that the mother was herself very stout may possibly be considered as supporting this view; although it is usually believed that whilst obesity is often hereditary it is rarely congenital. Among the lower animals a somewhat similar condition has been occasionally observed, and fœtuses thus affected have been called by the Germans *Speck-Kälber* (lard calves). They show enormous accumulations of fat in the subcutaneous connective tissue.

[1] The bibliography of these cases will be given at the end of the chapter in which giant fœtuses (the so-called fœtal hypertrophy) are considered.

[2] Clauder (D. F. W.)—"Stupenda pueri recens nati obesitas ex matris gravidæ impressione," *Miscell. curios. sive Ephemeridum.* Dec. ii., An. 6, Observ. cxc., p. 380. Norimbergæ, 1688.

Sandifort (E.)—*Observationes anatomico pathologicæ*, lib. iv., cap. ii., p. 21. Lugduni Batav., 1777.

Walther, (P. F. von)—*Ueber die angebohrnen Fetthautgeschwülste*, p. 18. Landshut, 1814.

Chambers (H. K.)—*Corpulence*, p. 139. London, 1850.

[3] "Sclerema and Œdema Neonatorum," *Brit. Med. Journ.*, Feb. 22, 1890.

The case shows in a very marked manner the difficulties which are met with when fœtal diseases are accompanied by the changes due to intra-uterine death; in such cases it becomes almost impossible to arrive at any satisfactory conclusion with regard to the pathological nature of the conditions found.

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